ELECTRICAL REVIEW

[ILLUSTRATED]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

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The McTighe Electric Light System.

The use of electric light has now become so common and familiar to the public, that any repetition here of the advantages to be derived from it would be superfluous.

The characteristics of proper electric lighting are:

1. Economy of power.
2. Simplicity in construction of the apparatus.
3. Durability of same.
4. Facility for repairs.
5. Steadiness and whiteness of light.
6. Efficient automatic regulation of the generator for any number of lights within its capacity.
7. Automatic adjustment of the power in accordance with the number of lights burning.

These are the necessities. If these can be obtained at a cost moderate enough to place the electric light within reasonable reach, then the acme of perfection is attained. This is precisely what the McTighe Electric Light and Manufacturing Company, of Pittsburgh, Pa., aims at.

THE GENERATOR.

By long and costly series of experiments this company has demonstrated that for practical purposes the "ring armature," when properly constructed, exhibits the highest efficiency.

The difficulty of winding such an armature, the almost impossibility of securing reliable insulation, and its high cost have heretofore operated against its logical development. All these difficulties are now removed.

The armature is formed of a number of gapped soft-iron rings, secured together and to the shaft by a number of through bolts, which pass through the arms of a bronze spider keyed on the shaft. This construction is thoroughly mechanical, and the rings can be displaced only by the shearing of the bolts, which is impossible. Hence the armature can be run at an extraordinary rate of speed (if necessary) with perfect safety. The shaft is steel, and runs in long bearings of the best bronze. The gaps in the iron rings enable us to wind the armature coils in a mould, and afterward slip them through the gaps on to the rings. The gaps are then arranged out of line so that all the coils are securely held on the ring.

By winding the coils in this manner they secure two very important advantages:

First—The coils can be perfectly insulated by winding them all over with a reliable and durable insulating tape, and before each coil is put on the rings its insulation is thoroughly tested.

Second—The coils being wound in a mould or "former," they are all exactly alike in length of wire, number of convolutions and electrical resistance; hence an armature composed of them will be in perfect electrical balance in all its positions, a fact which bears an important relation to the steadiness of the light.

By an entirely novel arrangement of the field magnets and pole pieces (see cut of complete machine) the armature is completely surrounded by the solid protection of the metal framing, and is not liable to injury from the exterior. While this is true, it is also true that in five minutes the armature can be taken out, or one or both the field magnets removed without disturbing the remaining parts.

The armature is not only mechanically protected on all sides, but this particular enclosing and protecting form of the pole pieces and field magnets concentrates all the inductive energy directly upon the armature, and none is wasted. Every pound of iron is thus made an active part of the field magnets, and does useful work. The commutator is of the simplest possible construction, and can be taken apart and put together with great facility.

The brush holders are arranged for greatest possible convenience and safety in handling, and can be instantly adjusted for any number of lights within the capacity of a given machine, in such machines as are not self-regulating.

The generator is graceful is design, and even in the most minute details mechanical advantage has been as much sought after as electrical efficiency.

There is no shirking of work or finish. Every machine for arc lights gives a standard current of ten amperes and an available electromotive force of at least forty-five volts per arc.

ARC LAMPS.

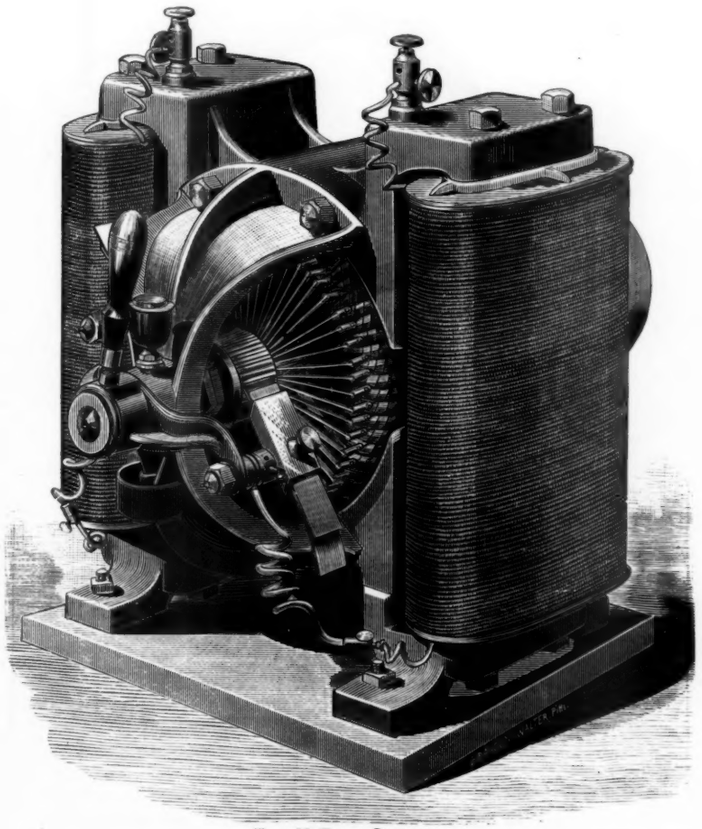
The final requirement noted for proper electric lighting is that the light shall be steady and white. The proper fulfillment of this requirement is very largely dependent upon perfect operation of the lamp, mechanically as well as electrically.

The lights appear to be uniform, perfectly white, and practically free from flickering.

When the feed of the positive carbon takes place, the light never goes out, as happens so frequently with some other lamps in use. But when the carbons are consumed, or when, from any accidental cause, a lamp ought to be extinguished, the extinction takes place instantly by the automatic action of its own mecbanism, without interfering with other lamps on the same circuit.

On the other hand, should the cause of such extinction disappear, the lamp will automatically relight, without the necessity of being poked with a stick or climbed after by an inspector.

The standard lamp weighs only sixteen pounds, is but forty-five inches total height, and is very tastefully designed, with a view to avoid all appearance of unsightliness.



THE MCTIGHE DYNAMO.

AUTOMATIC ARC SYSTEM.

In all extended systems of arc lighting (and in many smaller plants) a judicious regard for expenditure of power and saving of carbons requires that the dynamo should be capable of great elasticity in its generative functions. That is, in a circuit having a number of arc lamps, they should be able to burn any lesser number without changing the speed or having the trouble of adjusting the dynamo, and the power required should decrease in proportion. All this must be done without increasing or diminishing the brightness of the remaining lights.

The brushes do not move, nor are there any switches to get out of order. The brushes being stationary, are set always for maximum efficiency and minimum sparking—a result not obtainable in such systems of regulation as require an automatic movement of the brushes to regulate the current. By leaving the brushes in this carefully determined position at all times, the current for one lamp or for fifty lamps will be taken off by the brushes under the conditions of greatest efficiency, which is very hard to accomplish by any automatic movement of the brushes away from the line of highest efficiency.

The McTighe machine, having practically no movable parts, is easily taken care of, requiring nothing but oiling and an occasional trimming of the brushes. Lamps may be turned out at will, and the machine will instantly adapt itself to the new condition, and proportionately lessen the expenditure of power on the part of the engine. The lamps may even be all extinguished at once without endangering the armature or insulation.

STEAMBOAT HEADLIGHTS.

This company makes a specialty of powerful headlights for steamboats. These are very useful in making up tows, making landings, searching for shore, islands, and obstruction. On western waters particularly it is valuable, as the loss by the sinking of one coal boat (for want of light) will more than pay for several complete plants. It is really invaluable to rivermen.

The incandescent machinery manufactured by this company has the same general form as the arc machine, with the addition of an automatic regulator, which keeps the current produced proportionate to the number of lamps in use.

The McTighe system has been in successful operation in Pittsburgh, Allegheny City, Philadelphia, and several other cities for a year past, and seems to have gained a strong foothold, and wherever it has been introduced their plants have largely increased. The company will make an exhibit at the Electrical Exhibition in Philadelphia next month. See the following pages for illustrations of this system complete.

—— After shipping a dynamo and material to a prominent firm, the sender wrote a letter with the information, "We have shipped a dynamo with 200 volts." The reply came, "Dynamo received, but cannot find the volts."

Electric Railroads.

Our contemporary, the *Journal of Railway Appliances*, says that because our steam brothers have the monopoly of the power question, at present, on the railroads, they must not feel too proud or too safe. There is a rival fast coming to the front with capabilities vastly superior to steam—electricity. Infinitely more marvelous has been its growth, and infinitely more marvelous is its adaptability to the wants of mankind. It belongs to the realms where skeptics and doubters dwell to laugh at any application of nature's most recently developed force. Already in this country work is rapidly going on towards its application to railroading. Both Edison and Daft have carried on extensive experiments at their respective laboratories. At the Chicago exhibition a system entitled the Edison-Field had in operation an electric road in the building. (Where either Edison or Field come in is doubtful. Both generator and receiver, the most essential parts of an electric road, were of the Weston pattern.) Another noteworthy test was the one made at Saratoga Springs, under the Daft system, last fall. Here over a mile of an existing steam road was equipped and successfully operated. Now, again, the Daft system has established at Coney Island an electric railroad, on a decidedly practical basis, and it will be exceedingly interesting to watch its progress.

Running along the west side of the New Iron Pier, at West Brighton, a track 780 feet long, nearly the whole length of the pier, has been laid. The gauge is 24″. The rails are of T section, 8 lbs. to the yard, and 20″ long, each. They are joined by a new and substantial chair. The ends of the rails are laid on a specially-made plate; clamps are then put on, and the whole firmly bolted together. To help the conductivity at the joints, these chairs have been reinforced with strips of copper. The rails themselves are laid on strips of wood, and both firmly bolted to the pier planking. No attempt is made toward insulation. In fact, none is needed.

The generator for furnishing the current is a "No. 5," and capable of producing a six horse-power current. It is a "shunt wound," with low electro-motive force (a point which characterizes all of Mr. Daft's machines. Rarely does it ever in any machine exceed 125 volts. Generators as large as fifty horse-power have been built, but all within the above limit.) The intensity of the current varies, of course, with the external resistance; and obviously upon this resistance depends the speed of the motor. By external resistance I mean more especially that of the motor itself. Its normal speed is 1,100 turns per minute; its weight about 650 lbs. It is driven by one of the New York Steam Safety Power Company's eight-horse vertical engines. (Direct belting is possible, the speed of the engine being 250.)

The motor is modeled after its famous predecessor, the "Ampere," which ran so successfully last fall at Saratoga Springs. Its name is equally as happy and appropriate, if not more so—Pacinotti—the famous Italian inventor of a century ago. The body is made of 2″ ash, is 6.6′ long and 3″ wide. The superstructure consists of only a dashboard 20″ high, to which are attached the switches for controlling the motor; a box on the rear, 30″ wide, 36″ long and 15½″ deep, in which is placed the receiving dynamo; and, in front of this box and attached to it, the "motorneer's" seat.

On the right of this seat is the reversing lever for reversing the brushes on the commutators, hence the flow of current through the armature and thus its direction of rotation, giving either a forward or a backward motion to the motor. The running gear is simply four 12″ wheels, with 4″ centers, firmly attached to the body, and rigidly held in their place. To prevent short circuiting from rail to rail—*i. e.*, from one side to the other—the wheels on one side are specially constructed. An iron flange and an iron hub are firmly bolted to a solid, heavy piece of red oak. The wood effectually stops the tendency of the current to pass from one wheel to its opposite through the axle.

The receiver is a "No. 3," and capable of giving from three to four horse-power. It is compound, and its armature is capable of a large number of speeds, and this obviously means speeds of motor. The best armature speed is about 1,500. The weight of the receiver is about 450. The energy is transmitted to a counter, bolted up under the body of the motor, and from this to the wheels. The arrangement is double, and the best of belting is used.

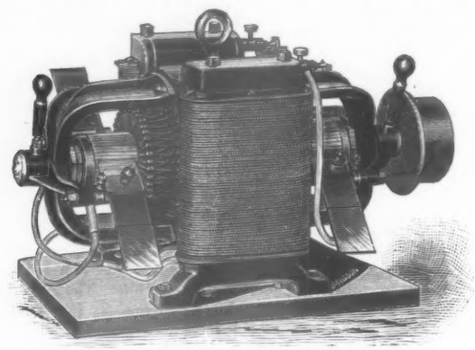
The governing apparatus is extremely simple. It consists of just two handles and the reversing lever. One handle controls the circulating of current in the receiver, and thus the speed of the motor, and the other is the brake switch. These unite in an exceedingly neat manner many combinations, and overcome several very troublesome points—such, for instance, as the heavy flash with its destructive result on breaking an electric current. The brake switch is furthermore so constructed that the "motorneer" can only have brakes on while his hand is on the handle.

The passenger service consists of two cars. They are substantially built, are 12′ 2″ long, 32″ wide, and seat twenty persons each—ten on a side, sitting back to back. This makes a total of forty persons carried comfortably. As high as fifty have been carried; nearly four tons in weight. The cars weigh about 400 pounds each. The total weight of the "Pacinotti" is 1,200 pounds; its maximum speed from twelve to fifteen miles an hour.

This season will give the Daft system a thorough test as regards safety, durability and reliability. Tests will be made upon which to base economical questions. It undoubtedly will prove itself fully capable, and will succeed in demonstrating beyond cavil its practicability.

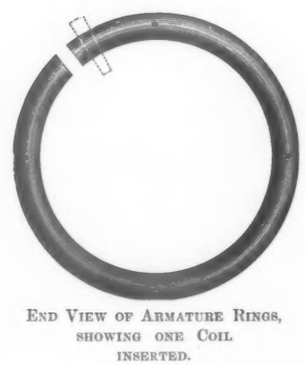
Abroad there are many electric railroads, all paying investments, and operated with a success surprising even to the most sanguine. Of course, this is too early a day to positively assert that they will ever be used on large lines. Still it would not be well to assert the other way. There are hundreds of miles of roads to-day which could undoubtedly be operated more cheaply and conveniently than they are to-day with steam. Especially is this true for narrow-gauge roads, horse railroads, and small lines in mines and mining regions.

As to reliability, there are electric light stations which have been run for years and not a stoppage. The same certainty could exist for railroads. Of course, accidents and maliciousness can never be eradicated.



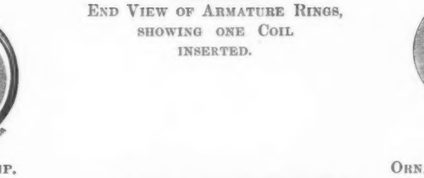
FRONT VIEW OF THE MCTIGHE GENERATOR.

STANDARD LAMP.

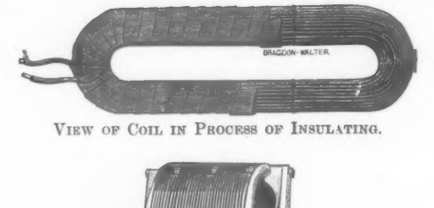


END VIEW OF ARMATURE RINGS, SHOWING ONE COIL INSERTED.

ORNAMENTAL LAMP.



VIEW OF COIL IN PROCESS OF INSULATING.



VIEW OF ARMATURE RINGS, SPIDER AND SHAFT, COMPLETE WITHOUT COILS.

As to durability, there is scarce anything to wear out. In the case of an armature keyed on to the driving wheel shaft, there would be nothing but the journals and boxes for the wheels themselves This may seem preposterous. So we thought, until we had investigated, and clearly saw it was even so.

In the matter of safety—as far as life is concerned, it is absolutely safe, *i. e.*, safe from danger to life through high potential of current. Section men could work with exactly the same impunity as they do to-day on steam roads.

Economy is one of the most vital points. Cheapness is not true economy always. It can easily be demonstrated that the balance of favor is on the electrical side. Obviously a full discussion of this subject cannot take place in so brief a space; but such a statement as this might be made and fairly upheld. (Mind, I do not mention the utilization of natural forces.) The average locomotive consumes, say, five pounds of coal per horse-power per hour. To get 1,000 horse-power on the track, then, by steam-power, 5,000 pounds of coal must be burnt. Take the electric motor: 1,000 horse-power at the motor must be had on the track. Allow the rather excessive figure of forty per cent. loss from generating station to motor in the transfer of the power by electricity, and we see we need about a 1,700 horse-power stationary engine to run the generators. The percentage of loss from steam engine to generator is but slight. A 1,700 horse-power engine plant could be run easily at two pounds of coal per hour per horse-power. Here we have, then, 1,000 horse-power on the track by electrical means, by the consumption of 3,400 pounds of coal, balanced against steam locomotives at 5,000 pounds. Obviously, there are many other points relative to keeping up steam for one or many trains, etc.; but even if this side of the question fell in favor of steam locomotives, the saving of expense in having only one man to run the motor, and in having a vastly smaller repair shop, would outweigh it. Other points come up relative to all the danger signals, etc., etc., which could be operated from the same central stations. Systems almost innumerable for blocking the road could be devised. Signaling could be carried on to perfection. Again, look at the electric brakes—quicker, more powerful, more economical and more reliable. Again, this fact: the means of more weight, and still not the actual weight for increased tractive force, and under the guidance of the "motorneer." Powerful electro-magnets are hung just above the rails. A portion of the current shunted through these and the motor is bound to the rails with a power equivalent to its weight several times over. Finally, considering the discomforts of travelers, etc., see how much more pleasurable it would be for them, and residents along the line, to be rid of smut, hissing steam and terrific snorting.

Now, since the stern and practical world has taken hold of the subject, I feel absolutely certain that the most marvelous progress will be made during the next ten years.

Electric Transit.

SOME FACTS AND FIGURES AS TO THE NEW ELECTRIC STREET CAR SYSTEM.

The electric car of Messrs. Knight & Bentley has been running nearly three weeks. There have been occasional stoppages, due to mechanical defects, but these have been about all overcome, the inventors say, and yesterday the car was running with perfect regularity, carrying passengers the same as a horse car, and making the regular schedule time. Occasionally the car was run at a speed of ten miles an hour to demonstrate what it could do. The construction of the road is very crude, the conduit not having been run with a level, but notwithstanding this the car rides fully as smoothly as the ordinary car, and with no more noise. The extension of the line, for which material has been ordered, will be laid in a much more substantial manner. Iron plates will be substituted for the slot in place of wood, and catch basins will be built every 200 feet. The inventors have a very ingenious method of

clearing the conduit of dirt and other accumulations. They also have a very perfect system of switches that the cars may pass each other. In about two weeks another car will be ready, and then three horse-cars and twenty-five horses can be dispensed with.

Dr. Everett, president of the East Cleveland road, expresses himself as entirely satisfied with the practical success of the new system, and in reply to numerous inquiries from all parts of the United States, has confirmed the telegraphic reports by an unqualified indorsement of its success. He estimates that with an expenditure of $150,000 for engines, boilers, dynamos, motors and conduits, a saving of something like $50,000 per annum can be effected over horses, besides giving them the additional benefit of rapid transit which always increases traffic. The company, it is understood, are looking for suitable ground on which to erect a power plant of 500 horse-power. They can get almost enough for their horses, and land that will not then be needed, to pay the cost of the improvements. They will probably select some location convenient to reach all their lines from, midway between Euclid avenue and Garden street.

All the street railroad men who have examined the car and system carefully, are struck with its great simplicity and practicability. It commends itself to them particularly on account of the comparatively slight cost of changing from a horse road. The ordinary cars are used, requiring no special construction and involving no great expense other than the motor itself.

One street-car man raised the point that the motor was expensive, but the inventors accepted his figures, saying, however, that they were too high, and explained that the sale of horses, harness, etc., would give enough money to pay for a motor. The inventors of the electric car also say that when it is considered that in changing to a cable road cars of special pattern, of very heavy construction and greater weight are required, while a grip car or dummy must precede every car, the advantages of this feature are apparent. Then the expense of changing to a cable road is enormous. It would cost the East Cleveland Company over one million dollars to change to a cable road. The Market Street railroad in San Francisco comprises altogether nine and one-fourth miles, and cost the great sum of $1,250,000. It was formerly a horse road, and was bought up by Crocker, Standford & Huntington for about $300,000. The profitable results of their investment are shown in the fact that while the road cost but $1,250,000 to build, the purchasers bonded it for $3,000,000, stocked it for $1,000,000, and pocketed the balance over the cost of construction. The bonds are now quoted at 117 and the stock at 137. As a horse road cars were run on it every three minutes, and an average of about 12,000 passengers was carried. Since its conversion to a cable road the cars are run every minute, and the daily average of passengers carried has more than doubled. The cars are run at a speed of eight miles an hour, the limit prescribed by city ordinance. Nearly all the horse roads in San Francisco have been displaced by cable roads. The cost of changing the track of an ordinary road to a cable road ranges from $40,000 to $70,000 a mile. Messrs. Knight & Bentley estimate that the track expense of the electric road will not exceed $5,000 a mile. The cost of the East Cleveland road now in operation has been very much less than this. The cost of power plant is about the same as that for cable roads, and the cost of the special machinery required corresponds to the cost of the dynamos. If the horse road is changed to a cable road the cars must be changed also, which is not the case with an electric road. Every horse car requires a complement of eight horses, and every horse costs 50 cents a day to feed, and for care, so that the horse expense of each car is never less than $4 per day. The depreciation of each horse is 10 cents a day, and the total expense per car is never less than $5 per day. An electric plant of 500 horse-power, which would give a surplus of probably 200 horse-power, would not cost $50 per day to maintain and would operate forty cars easily, or at the rate of $1.25 per car per day. Careful experiments made in England recently, show that a greater economy than this can be attained, and that on a like basis here the cost of an electric car would not exceed $1 per day per car for the motive power. An expensive item in the operation of horse roads is the depreciation of horses. The average useful life of a street-car horse is about three and one-half years. The depreciation on some of the Cleveland lines last year was 40 per cent. Official statistics show that the average life of a street car horse is about three and a half years, so that the average annual depreciation is about 30 per cent. The East Cleveland Company use 450 horses, the average cost of each of which is about $125, and the single item of depreciation of horses consequently amounts to nearly $20,000 per annum. On the New York lines the depreciation is much heavier. In abolishing horses almost enough can be realized from the sale of horses, harness, etc., to about pay the cost of fitting up the cars with motors. The cost of shoeing horses is another item of no inconsiderable consequence.

THE MCTIGHE HEADLIGHT.

An Electrical Testing Establishment.

Our contemporary, the London *Electrician*, in a recent article on the above subject, says that, as a rule, a want has only to be put into words and made public in these days to be satisfied. There are many electricians and mechanics who have from time to time felt the want of a place where they could work out their ideas without fear of having the fruits of their labors indirectly pirated or directly filched from them—a place where the necessary tools, steam-power, testing apparatus, *et hoc genus omne*, would be at their disposal on moderate terms. Many, again, are able to perfect their work at home, but have no means of testing its performances or capabilities. A man may, for instance, make an incandesdent or arc lamp, or build a dynamo, construct a battery or turn out a switch, but have no photometer, current meter, or other means of testing his productions. He may know of many places where the necessary apparatus is to be procured, but the price is too much for him, inventors as a rule having but little cash, and having already spent as much as they can afford in producing their apparatus in the rough. Or, again, there may be many works with which he is acquainted where the requisite testing instruments or machines are to be had, but he is shy of going to them from fear of his secret leaking out, a fear which, righly or wrongly, strongly possesses inventors. What is wanted, then, is an establishment provided with every requisite for working and testing all kinds of electrical machinery and appliances, where an inventor may work out an idea *ab initio*, or where he may complete his rough model, test it thoroughly, and, if he desires, obtain an expert's report as to its capabilities.

Mr. F. Geare Howard, 36 Cleveland street, W., has for some past been using incandescent lamps to light a portion of his works, and has also devoted considerable time and attention to electrical engineering. Having plenty of steam-power, a workshop with every convenience in the shape of machine tools, and some light airy rooms at his disposal, Mr. Howard proposes to establish just such an electrical testing establishment as we have sketched above as being required. We recently paid a visit to his works, and may briefly state here what we saw.

The major portion of the works is given up to furniture making, many machines driven by steam power being used in the work. The engine used to drive these machines indicates 60 horse-power, which is considerably more than is required for use in the work, so that Mr. Howard can dispose of from 1 to 30 horse-power for driving dynamos, &c. The rooms which it is proposed to devote to electrical purposes are separated from the works, but shafting runs through to the dynamo room and tool shop, which is fitted with fast and loose pulleys, so that power is always available. There is also a Crossley Otto gas engine in the dynamo room always ready for use, but as it does not run very steadily Mr. Howard will replace it by a steam engine. At present there is only one dynamo in place, viz.: a Siemens machine, giving 70 volts and 35 amperes, used to feed the incandescent lamps in the tool shop and test room. The former is immediately above the dynamo room, and is fitted with lathes, drilling and planing machines, all run by steam power, and every kind of hand tool. The incandescent lamps in this shop are so fitted above the different machines that they can be lowered or raised to suit the convenience of the worker. From the tool shop we pass into the test room, which is large, well-lighted, and airy. The lighting is effected both from the roof and the side, and it would be hard to find any room better suited for testing purposes. Here there are rows of secondary batteries, both the Elwell-Parker and the Crompton-FitzGerald, ready charged, so that any one wanting forty amperes, say, for half an hour, can have them. Here also are meters, variable resistances, incandescent lamps, switches, and other apparatus. We noticed amongst others Ayrton and Perry's volt and ampere meters, Crompton and Kapp's current and potential indicators, Siemens' dynamometer, &c. In a room below this is a powerful press, which might be used for secondary battery plates or for any purpose requiring great pressure. All of the above instruments and apparatus will be at the disposal of users of Mr. Howard's testing establishment.

For those who wish to carry out tests or experiments in the strictest privacy, Mr. Howard is fitting up two rooms on the other side of the works. One of these will be turned into a dark room for photometer work. Mr. Howard's idea is to run wires into these rooms, supply his customer with all the apparatus he requires, learn what current and E. M. F. he wants and for how long, and then, having fulfilled his wishes in this respect, leave him to lock himself in and carry out his experiments in as strict seclusion as the most suspicious of mortals could wish for.

From what we saw during our visit there is no reason why Mr. Howard should not succeed most thoroughly in his endeavor, nor why his establishment should not develop a reputation in the electrical world similar to that enjoyed by Mr. Kirkaldy's famous testing works amongst engineers and ironfounders.

We hope some of our enterprising and public spirited New Yorkers will soon imitate the excellent example of Mr. Howard and give us the same facilities here. It can be done with profit to all concerned.

New Electric Batteries.

A novel thermo-chemical battery has been invented by M. Vincent Riatti, professor in the Polytechnic School at Torli (Italy). The production of the current results from the difference of temperature of two layers or strata lying at different levels in a vessel filled with liquid. The cell consists of a wooden box or vessel traversed by two copper pipes placed the one over the other, and separated by a distance equal to about half the height of the vessel, which is filled with a solution of sulphate of copper. A current of steam passes through the upper tube, and a current of cold water in the lower, with the effect that copper is deposited on the latter, while the substance of the former is reduced. By changing, from time to time, the position of the tubes, equilibrium is established. This battery is said to work well and not to polarize, but up to the present no practical information as to its performance has been published, and consequently we cannot do more than call attention to the principle of its action. M. Grimfeld, of Vienna, has devised a modification of the Callaud battery, in which there is employed a glass vase divided in two by a mid partition half the height of the vase. The two upper halves are thus in free communication, while the two lower halves are separated by the partition. In the bottom of one of the cells is placed the disc of copper; the zinc is at the top of the other. By this arrangement the deposition on the copper of black particles falling from the zinc is avoided; at the same time, however, the resistance of the cell is increased and its cost augmented. A modification of the Leclanche element has received from its author, M. Fein, of Stuttgard, the name "immersion battery." It consists of a glass vase at the bottom of which is placed a layer of binoxide of manganese. The vase is closed by a cover carrying a carbon, and a ring of zinc. An inverted flask filled with a solution of chloride of ammonium keeps up the supply of liquid.

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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The "Old-Timers"—men who were telegraph operators prior to 1863—and the Military Telegraphers had a reunion in St. Louis last week. The attendance was very large, and included some of the best-known telegraph men in the country.

It is reported that Judge Wallace has notified counsel that he will be ready to hear the arguments in the Drawbaugh suit September 15th. With Mr. Conkling on one side and Mr. Edmunds on the other, there will surely be something worth hearing on both sides.

The Nebraska Telephone Company, we are pleased to learn, is in a very prosperous condition. Its profits enable it to pay its stockholders eight per cent, take care of its construction, and lay aside something every year. This certainly speaks well for the management.

Forty years ago there was not a telegraph office in existence. To-day there are over fifty thousand offices in the world, very few of which are not connected with the general network which covers the face of the globe, and gives universal connection. There is no industry whose statistics are so wonderful as those of the telegraph.

The following telegram from Washington contains important news affecting those interested in the storage battery systems: "Priority of invention has been awarded Brush, as against Keith, Shaw, Faure, Maloney and Burgess, in all pending interferences, thereby entitling Brush to the broad claims on secondary batteries."

Considering the unanimity and persistence with which the American press has insisted that overhead wires are not allowed in London, it is interesting to note the discussion that is now going on in English papers concerning the rapid increase in the number of overhead wires in the metropolis. The fact is that, as compared with the whole number of wires in use there, the number of actually buried conductors in London is very small.

A sea captain who, on hauling up his anchor, found a telegraph cable attached to it in such a way that he must either cut the cable or lose his anchor, resolved on the latter course, and is to be rewarded with a gold pocket chronometer, the gift of the New York *Herald*. It was not the Bennett cable, but Mr. Bennett very properly feels that such action should be rewarded, and, if nobody else will take a hand, he will.

The "underground conduit" schemers must remember to make their mains big enough, not only for the wires now in use, but for many more to come—not only to supply the needs of present companies, but of very many more that are sure to grow out of new inventions. For instance, the telemeter. It is bound to make its way, and it has got to have wires. So we throw in this kindly word of caution about the conduits—make them big.

Tower lighting continues to find favor in the West. The town of Winona, Minn., has put up five towers, with six lights on each, and is greatly pleased with the flood of soft, mellow light with which its streets are flooded at night. This system, no doubt, answers admirably for Western cities, with low buildings and wide streets, but would hardly answer for the compactly-built cities of the East. Nevertheless, there are many rural towns in New England and the Middle States where it might be advantageously used.

We have received from Messrs. Terry & Finn, of Buffalo, a copy of their "Illustrations and Descriptions of Telegraphic Apparatus," published by Astley C. Terry, of Buffalo. The plates, which are large and clear, illustrate the methods of setting up and connecting the various kinds of apparatus used in telegraphing, and the text gives explanations which make all so clear that he who runs may read. This little volume will prove invaluable to all telegraphers who have occasion to set up or rearrange offices, and will be found to impart much valuable practical information to all students of the art of telegraphy.

The British Post Office has, to a very great extent, rescinded the restrictions which have hitherto hampered the operations of companies doing a telephone business, and have agreed to modify the terms of the licenses held by them, so that the companies will be enabled to pursue their business with some approach to the freedom that obtains in this country. As we understand it, the payment of a royalty of ten per cent. on gross receipts to the Post-Office Department is to continue, but the provision which required any licensed company to sell any required number of their patented instruments to the Government is to be striken out. The *Electrician* sees, as an outcome of free trade in telephones, and the breaking down of all monopoly, whether of the Government or of the company, a vast increase in the number of overhead wires. It might also have predicted the one thing that England most needs in this direction just now—better telephone service and a more general use of the instrument.

The following communication comes to us from Washington:

To the Editors of the Electrical Review:

Why do not electrical mechanics turn their attention to the propelling of cars by the electrical energy given off by them when in motion. This is now lost, but *may* be collected and used in propelling the car. Myself and associates are fully satisfied that a car can be built, and loaded with energy sufficient to get it into motion, and keep up the motion until a velocity of five or ten miles per hour is attained, when sufficient energy can be collected by the appliances to continue the motion. The greater the velocity of the car the greater will be the amount of energy that can be collected. This is no chimera, but can be demonstrated practically, and will be before many months.

JOHN CORSON.

It was Faraday who said that, outside of pure mathematics, it would not do to pronounce the word "impossible," but the trouble with Mr. Corson's idea is that it seems to be *inside*. Lifting one's self by the boot straps has never been a success, and there are certain inevitable deductions from the law of the conservation and correlation of forces which would seem to stand in the way of the practical application of the proposed plan. Still, we are open to conviction, and whenever Mr. Corson and his associates get ready to demonstrate the practicability of their scheme, we stand ready to give the facts to our readers. If accepted physical laws, based upon experiment and study, laws which all scientists look upon as immutable, are moonshine and nonsense, the sooner we find it out the better. And, on the contrary, if the ideas of those who deny the existence of those laws are moonshine and delusion, the sooner they find it out the better for *them*. One word to Mr. Corson. Don't wait to get up a big company and build a big car. Make a model a foot or two long, build a circular track six or eight feet in diameter, start your car by hand, and then let her go—*if she will*. If she will go an hour she ought to go a century. So, there you are, with an "if." Perpetual motion—with an "if." Millions in it—with an "if." Meantime scientific investigation will proceed in the usual sedate manner, with serene confidence in the supremacy of ascertained physical law.

The letter from which the following extract is taken was not intended for publication, but it has seemed to us that it affords an excellent text for a little talk, which may interest many besides the writer of the letter, who says: "I am a student of telegraphy, and desire to inform myself of the different plans and ways of setting up and using instruments. I candidly want to ask if, in the course of a year, your paper will teach me as much as a book which could be obtained with the same money." It is our hope and belief that, in the broad sense, the ELECTRICAL REVIEW will, in any year, teach more to its readers than could any one book that would cost the same amount of money or more, but it is not the province of a newspaper, although technical, and devoted to a special branch of science and the industries that rest upon it, to take the place of a textbook. If our correspondent wishes to confine himself solely to telegraphy, and has no ambition to know anything beyond the setting up of instruments, he should buy the cheapest manual he can find, or ask some operator to show him the necessary connections. But if, on the other hand, he desires to have some understanding of the nature and characteristics of the great force which renders telegraphy possible, then he will not only read the ELECTRICAL REVIEW, and other periodicals of its class, but also every book on the subject upon which he can lay hands. The man who thinks that any one paper, any one book, or any one man can tell him all that there is to know, or all that it is well to know, to be an *intelligent* telegraphist even, is very much mistaken indeed. Those who know the most are most ready to admit that they know but little, and the greatest teachers of electrical science call themselves students. If it be the sole aim of our correspondent to know how to "set up" and send messages, he has no use for this or any other paper. If, on the other hand, his desire is to have a broad and comprehensive knowledge of the subject, one that will enable him to understand its literature and keep pace with its progress, he needs not only this paper, but all others, and, for special information, all books in which it is to be found.

New Orleans people must have far more energy than Northern people have ordinarily given them credit for—to have accomplished what they have during these hot summer months towards making the approaching World's Exhibition a success. The original idea was to have a Cotton Exhibition solely, to mark the one hundredth anniversary of the first shipment of cotton from this country to England, in 1784. The shipment amounted to about one bale, and, as the annual shipments now foot up about four million bales, it seemed fitting that something should be done to mark the close of the first century of this great branch of commerce. But it was soon determined, in view of the newly-awakened interest in manufacturing in the South, to include machinery of all sorts, and from this the step was a short one to making it a World's Exhibition in the broad sense of the term. The work has been taken hold of in earnest; the State and United States Governments have lent their powerful aid; very large, commodious and handsome buildings, some of them larger than any structures ever built for any such purpose, have been erected, and everything is in a state of gratifying forwardness, so that it is now well assured that the Exhibition will be duly opened in December, the time appointed. To us in the North and East, New Orleans seems a long way off and hard to reach, but we are glad to announce that the railroads will make every endeavor to supply quick and comfortable transportation, and that round trip tickets will be sold at principal points at about one-half the usual rates. This fact alone ought to pour a full flood tide of travel into New Orleans next winter, even without the attraction of an Exhibition.

TELEMETRY.

This is the name that has been given to the art of transmitting to a distance, and, in some cases, of recording at one or more distant points, measurements of various kinds. For instance, a metallic thermometer is placed in a ward of a hospital, which it is desirable to have kept at a certain fixed temperature. This it is the attendant's duty to watch. But attendants do not always do their duty faithfully, and it is desirable that the surgeon in charge, sitting in his office, should have means of knowing constantly just what the temperature of the room in question is. By the application of the telemeter, which is connected with the thermometer by wires, every variation of the temperature of the room in question is not only shown, but recorded, and, in the event of any serious variation, the limits of which may be set beforehand, a bell is rung to call attention to the trouble, which may immediately be rectified. In the same manner, steam pressure, barometric pressure, wind velocity, water pressure, height of water in basins, reservoirs or canals, and, in fact, the measure of anything that is variable, can be transmitted and recorded.

It is difficult to estimate the value of this art, and of the many ingenious devices which make it practically possible to attain it. For purposes of scientific investigation in meteorology it will prove invaluable, for in many exposed positions where a party of observers could not be maintained without heavy expense it only becomes necessary to install a set of instruments and connect them by wires with the nearest established station, where every variation of temperature, atmospheric pressure, wind velocity and direction, and even of magnetic variation, would be instantly received and recorded. In navigation it enables the captain, by having a proper instrument in his cabin, to note every variation in the temperature of the water—a factor whose importance is every day more and more recognized. In factories it serves the purpose of a fire alarm and much more, while its value in breweries, malt-houses, oil and sugar refineries, storage warehouses, wine and beer vaults, greenhouses, grain elevators, potteries, schools, churches, and all public buildings, needs only to be considered to be appreciated.

To take one simple illustration, let us take the case of a cold storage warehouse. Such an establishment is divided into a number of sections or rooms, each designed for some special purpose. One of these, for instance,

is designed for dairy produce, another for eggs, another for meats and poultry, while a fourth is for fruit. It will clearly be seen that each of these sections requires a temperature different from the others, for the reason that a degree of cold which would not injure meat would utterly ruin fruit. The object is to keep each room just cold enough to preserve its contents, partly because too great a degree of cold might work injury, and partly because the production of this cold temperature costs money. In each room a thermometer is placed, and all are connected on one circuit of wire. In the office is an instrument for each room, and each gives a constant indication and permanent record of the temperature of the room which it represents, while any marked variation—say, of four or five degrees, according as the instrument is set—would result in the ringing of an alarm bell. It has more than once happened in storage warehouses that, owing to the carelessness of attendants, the temperature has gone so low as to freeze fruit and vegetables solid, or so high as to "turn" meat and poultry, causing great loss. With telemetric appliances such results would be impossible.

What is true of storage warehouses is equally true of all the various kinds of manufacturing establishments which we have enumerated and many more, in which the maintenance of a certain ascertained temperature is necessary. We are glad to add that the instruments by which these valuable results are obtained are to be shown at the Electrical Exhibition in Philadelphia, where they will, no doubt, attract great attention.

The Electrical Exhibition.

The Electrical Exposition at Philadelphia will remain open from September 2 till October 11, and is expected to surpass those previously held at Paris, Munich, Vienna, or London.

A department of interesting and beautiful exhibits will be devoted to electro-plating. The invention of the dynamo machine has worked, perhaps, a greater revolution in this art than in any other where electricity is used, a fact of which the exhibits will afford some astonishing proofs. The dynamo, by giving a steady and powerful current, has made the electro-plater independent of the Voltaic battery, which produced an uncertain and inconstant current. The dynamo has also stimulated the art of electro-deposition, and has led to its application to the reproduction of medals, coins, and works of art. In this department will be placed a reproduction of the collection of medals and coins in the British Museum.

The exhibit of telephones will be very complete, including models of the earliest inventions. An interesting feature for out-of-town visitors will be a completely equipped exhibit of the "central station" system of telephoning as used in large cities. During the Exhibition, it is hoped to make some experiments in long-distance telephoning, when, probably, Philadelphia will talk with Boston and Chicago.

All sorts of machinery, light and heavy, will be seen running under the impulse of electric motors of various patterns. Printing presses will run off newspapers, and sewing machines will do the most delicate stitches, driven by the same subtle current. Every effort will be made to illustrate the use of electricity as a motive power from which so much is expected in the future, when man has learned how to generate electricity from natural forces, carry it to a distance, and there reconvert it into mechanical force.

The Government exhibit will be extensive. The signal service will show how electricity is applied to its registering instruments. The Navy Department will show how it proposes to defend our harbors by electric torpedoes, and will exhibit an enormous search light of 20,000 candle power, by which the submarine depths may be illuminated and the approach revealed of any foreign engine of destruction. The Lighthouse Board, and, possibly, the War Department, will also furnish exhibits.

Some of the most curious things shown will be the instruments of precision and philosophical apparatus. In this department there will be many foreign exhibitors. The transmission of luminous effects by selenium, by which it may some day be possible to reproduce one's image many miles away, will also excite no little wonder.

It is the intention of the Franklin Institute to make a very thorough report upon the exhibition, which will include the results of exhaustive electric measurements and tests by a board of examiners. This will be published in book form and illustrated, and will represent the exact scientific work and result of the exhibition. It is hoped that it will be a permanent and valuable contribution to scientific literature. No medals or premiums will be given to exhibitors, but the reports of the examiners will speak for themselves. Also of great value will be the reports of the electrical commission, appointed by the President, of which Prof. Rowland, of the Johns Hopkins University, is the chairman.

Popular lectures upon electricity, its theories and its practical applications, will be given by many eminent scientific men in the waiting room of the station. Every effort will be made to secure the attendance of school children, not only from Philadelphia, but from other cities; and a general popular enlightenment will result in regard to a branch of science which has made such rapid progress that it has outstripped public comprehension.

Inventions of Half a Century

The number of inventions, says a contemporary, that have been made during the past fifty years is unprecedented in the history of the world. Inventions of benefit to the human race have been made in all ages since man was created; but looking back for half a hundred years, how many more are crowded into the past fifty than into any other fifty since recorded in history. The perfection of the locomotive, and the now world-traversing steamships, the telegraph, the telephone, the audiphone, the sewing-machine, the photograph, the cylinder printing press, chromo, lithograph printing, the elevator for hotels, and other many-storied buildings, the cotton gin and the spinning-jenny, the reaper, the mower, the steam-thresher, the steam fire-engine, the improved process for making steel, the application of ether and chloroform to destroy sensibility in painful surgery cases, and so on through a long catalogue.

Nor have we yet done in the field of invention and discovery. The application of coal gas and petroleum to heating and cooking operations is only trembling on the verge of successful experiment; the introduction of the steam from a great central reservoir to the general use for heating and cooking is foreshadowed as among the coming events. The artificial production of butter has already created a consternation among dairymen. The navigation of the air by some device akin to our present balloon would also seem to be prefigured, and the propulsion of machinery by electricity is now clearly indicated by the march of experiment. There are some problems which we have hitherto deemed impossible of solution; but are the mysteries of even the most improbable of them more subtle to grasp than that of the ocean cable, or that of the photograph or the telephone?

We talk by cable with an ocean rolling between; we speak in our voices to friends a hundred miles or more from where we articulate before the microphone. Under the blazing sun of July we produce ice by chemical means, rivaling the most solid and cystalline productions of nature. Our surgeons graft the skin from one person's arm to the face of another, and it adheres and becomes an integral portion of his body. We make a mile of white printing paper and send it on a reel that a perfecting printing press unwinds and prints, and delivers to you, folded and counted, many a thousand per hour. Of a verity, this is the age of inventions; nor has the world reached a stopping place yet.

Editors Electrical Review:

GENTLEMEN:—The Dallas Exchange has lately been thoroughly rebuilt, and the service is A 1. Our crosses and other troubles are reduced to almost a minimum. There are 13 employees in the exchange and territorial departments. We have seven territorial lines centering here connecting 52 towns and cities in north Texas. Additional wires between Dallas, Fort Worth, Sherman, Waxahachie, Cleburne, McKinsey, and other important points will doubtless have to be built the coming year to accommodate heavy and increasing business. Dallas Exchange has 315 subscribers, and we are extending first class pole lines to East Dallas, 1½ miles from central office, to connect new subscribers there. Mr. E. K. Baker, superintendent First District, has his headquarters here, and is a wide-awake, thorough man, and doing much towards constantly improving the territorial service of which his district covers over 700 miles.

Our contemporary, the *Telegraph Advocate* says that the average salary of Western Union operators, at 195 Broadway, is a fraction less than $56 per month. Ten years ago it was $92. The amount necessary to maintain existence is made up by working extra. The regular nightman works extra days, and the regular day man works extra nights. At what sacrifice? At the cost of health, comfort, pleasure, independence, and life's whole future.

Electro-Pneumatic Valve.

It is impracticable to open and close valves such as are used upon steam pipes by the direct agency of electricity. Many appliances have been used to close valves on air pipes or the draughts of furnaces by clock-work set in motion by electricity, but these have proved unsuccessful, for the reason that only small and easily-moved valves could be operated, and the mechanism was large, complicated, and expensive. The device is the invention of Professor W. S. Johnson, an electrician of Milwaukee—makes use of compressed air which acts directly upon a piston, or its equivalent, and actuates the valve, which may be of any size. Since the electricity only performs the simple duty of admitting or releasing the compressed air from the chamber that operates the piston, a very feeble current is allsufficient, and, what is more important, the same quantity of electricity will move the largest valve in the world, as it will move the smallest; in other words, a single cell of any battery will stop the largest engine. The air is stored in a small tank that is filled, as occasion requires, by means of a small air pump.

The valve is used on all pipes of steam, water, or brine systems.

By means of a thermostat, the electric valve may be used to control temperatures, the electric circuit being closed when the apartment reaches the desired temperature. The valve permits the compressed air to enter the diaphragm valve and shut off the steam, hot air, circulation of water, or whatever is the source of heat. Common gravity batteries are employed to operate the device, or it can be arranged so as to be worked by an open circuit battery, like the Leclanche. But a few minutes' work each week are required to keep the pressure in the reservoir up to ten pounds.

This system is simple, automatic, and noiseless, and the many uses to which it may be put will be evident to our readers. When placed upon the heating pipes of a building it insures not only a temperature just warm enough, but one in which there are no fluctuations beyond the fraction of a degree. When applied to heating apparatus, the same battery and air reservoir answer for all the valves, a small gas pipe conveying the compressed air from the reservoir to all parts of the building.

These devices are made by the Milwaukee Electric Manufacturing Company, of Milwaukee, Wis., and will be exhibited at the International Electrical Exhibition, to be held under the auspices of the Franklin Institute, Philadelphia.

Lightning Rods.

"Not one out of a thousand lightning-rods at present upon our buildings is of any use, for the simple reason that the rods are not led into moist ground, and therefore offer great resistance to the passage of an electrical discharge." Such is the dictum of John Trowbridge, in an article published in the last number of *Science*. When it is remembered how persistently the lightning-rod fiend attacks the dwellers in small towns and in the country, more especially in the Western States, and how successful he is in persuading people to put up his system of rods and points, it is evident that if Mr. Trowbridge's assertion is correct a large amount of money must be expended uselessly, except in so far as it benefits electrical quacks. Just as the public is slow to learn that not every man who practices medicine possesses the requisite knowledge, so it is slow to learn that the name of electrician does not necessarily prove knowledge of electricity; and just as the public to a great extent looks upon the druggist as a kind of doctor, so does it look upon the lightning-rod agent as a kind of electrical expert.

Mr. Trowbridge assures us that one lightning-rod company placed lightning-rods shaped like a letter U upon the roofs of houses, upon the baseless theory that if the lightning struck one point of the U it would be dissipated into the air from the opposite point.

For a hearty condemnation of this arrangement an American professor of physics was recently sued for damages by the company—damages for truth telling. Another company in Massachusetts has an electrician who needs not and possesses not works on electricity. With a forked stick, a divining-rod, he hunts for "earth currents," and, should he find one, pronounces that a lightning-rod is needed by the house near it. If he finds no such current he announces the house to be safe. Whether he often arrives at the latter conclusion we are not told. How pitiable seems the ignorance of those who lose their purse-strings because a stick, held in the hands of an interested operator, points to a fancied rivulet of electricity!

The use of lightning-rods is based not only on Franklin's well-known experiment but on that of Faraday, who showed that powerful discharges of electricity between a metallic cage, properly connected with the ground, and an electrical machine were not only without effect upon a person standing in the cage, but were unmarked by the most delicate electrical instruments within it. A metallic netting placed over a building would be an efficient protection. The nearest approach to this is to connect "all the tin sheathing, the copper gutters, the gas and water pipes with the lightning-rod, and to conduct the latter by the shortest course possible to *wet earth*." Mr. Trowbridge tells us that with a couple of galvanic cells and a wire it is easy to prove that when a lightning-rod enters *dry* earth there is considerable resistance to the passage of electricity. When all the metallic conductors of a house communicate with the lightning-conductor and the latter with wet earth the danger from thunder storms is reduced to a minimum. A single telephone or telegraph wire entering a house may be a source of danger, but the risk disappears if the wire is connected with the gas or water pipe. Above-ground wires are a protection to the buildings near them.

With regard to the use of lightning-rods our authority tells inquirers: "If your house is surrounded by tall trees, or if there are higher houses in your immediate neighborhood, trust to the trees, or kindly leave the expense of the lightning-rods to your neighbor.

If your house stands alone, a prominant point in the landscape, or remote from trees . . . place two or three pointed rods three or four feet above the highest point of the house; allow the metallic rod, which should be at least one-half a square inch in section, to rest without glass insulators, upon the house," and connect, as before stated, all metal work with it.

Telephonic News

*** The stock of the new England Telephone Company and also the Erie, have been making a steady advance of late, and may soon climb back to their former places.

*** The annual clam bake given by Mr. Phillips, as will be noted elsewhere in this edition, was, as usual, a most enjoyable affair; and brought together the usual host of prominent men in the electrical field.

*** Col. Beetle reports a favorable outlook for all kinds of business, west and south. The electric light and telephone people are active, and a steady increase in subscribers is everywhere reported, and several companies which have not paid dividends lately will do so before January 1st.

*** It is stated in Boston that Mr. Charles J. Glidden has resigned as secretary and auditor of the New England Telephone Company, to remain as treasurer of the Erie Company; and General Manager L. N. Downs and Solicitor William H. Bent, of the Erie Company, have placed their resignations with the company's directors. It is not likely these resignations will be accepted.

*** Some interesting experiments were made with the telephone recently between Rome and Florence, Signor Genala, the Minister of Public Works, several times communicating with Signor Gadda, the Prefect of Florence. The two telephones, which were connected by ordinary telegraph wires, worked successfully enough, although the buzzing precluded a perfectly distinct transmission of the voice. On the other hand, a cornet played at the Florence end was very well heard at Rome.

*** General Manager Downs returned from his short vacation on Monday last looking well and happy. This, we understand, was the first time he had taken a day's rest during his six years in the telephone field, and we can safely say that no one has done more to promote that interest than he during that time, or more faithfully earned a good rest. His company still heads the list with the largest number of subscribers of any telephone company in the world to-day. The New England Company, of which he is general manager now scores 18,500 subscribers, and the Erie about 10,000.

*** The Lancashire and Cheshire Telephone Company, of Manchester, England, make the following showing of the last year's progress: On 30th June, 1883, the total number of subscribers to the various exchanges was 2,359, and of private line renters, 697; this year, on the same date, the figures were 2,734 and 828 respectively. As regards the money value of this increase, it may be stated that on 30th June, 1883, the business (including work not finished) represented orders on the books equaling a gross income of £54,498 3s. 8d. per annum, and on 30th June, 1884, £61,149 0s. 6d, showing a net increase of new business to the extent of £6,650 16s. 6d.

*** The government of England watches with a jealous eye those corporations that serve the public lines conflicting with the branches of government service. Thus the telephone companies are laid under the heavy burden of paying into the national treasury 10 per cent. of their gross receipts, and there are other regulations which tend to keep their revenues down and their terms to the public high. Postmaster-General Fawcett has just secured the consent of the House of Commons to a relaxation of some of the conditions, based on complaints and suggestions by the companies. According to the new arrangement, the 10 per cent. royalty is to be continued, but the post-office gives up its right to claim an unlimited supply of the instruments for its own use, and the limitations as to extent of service are removed. Telephone companies are not to be allowed to receive or deliver a written message at any point. In justice to Mr. Fawcett it must be said that he has conceded more than the companies asked, notably the giving up of the government claim on instruments.

A London correspondent writes that considerable interest and inquiry is manifested abroad in regard to the contemplated Electrical Exhibition by the Franklin Institute in Philadelphia this fall. While there does not seem to be a disposition to go to the expense of exhibiting, yet the interest manifested to obtain all the information possible is laudable, and many are coming to Philadelphia, which demonstrates chiefly that the United States is regarded as the foremost and most progressive nation in the practical application of the science of electricity. In this regard it is somewhat surprising and interesting to take a comparative view of the progress of the telephone, for instance. In the United States, according to the last report of the American Bell Company, they have 123,000 subscribers on the public exchanges of the various subsidiary companies, while in Great Britain, using the same system, and having been in operation for more than four years, and excluding the number of telephones used by the Post-office for public business, the entire number of subscribers will barely exceed 10,000. It is estimated with all the telephones in use on public exchanges and on private lines, that while 50,000 for Great Britain would be an over-estimate, it might not be out of the way to say that there are in use in the United States very nearly 500,000 telephones, public and private. This state of affairs is owing to several causes in Great Britain, one of the causes being the conditions and restrictions placed upon companies by the Post-office departments in the endeavor to prevent the telephone in private hands from encroaching upon the telegraph, which is a Government monopoly. The main reason, however, seems to be the want of liberal and progressive management on the part of the United Company, who own and control the Bell, Edison, and Blake patents. Notwithstanding that they defeated the London and Globe Companies and bought out their plant, they do not seem to be alive to the improvements which have been made in the United States, especially with regard to an efficient exchange system.

It may be interesting to you to know that a recent attempt was made to re-organize the London and Globe Company, in which two gentlemen of your city were largely interested. The main difficulty of the London and Globe Company was that under the decisions in the English Courts in favor of the United Company, the Globe Company no longer had an instrument which they could use, and therefore they were compelled to accept a proposition from the United Company to buy them out for £25,000 in cash. A provisional agreement to this effect was entered into by the Board of Directors of the London and Globe Company on the 24th of June last, which was to be ratified by the shareholders of the Globe Company at a general meeting to be held within one month from that date. On the 16th of May, Mr. Jerome Carty, of your city, in behalf of the Clay patents and certain English patents which are clear from infringement under the English decisions, and on behalf of an English Syndicate, out-bid the United Company and offered to reorganize the London and Globe Company with the new patents and £40,000 of new capital. This offer led to a dispute among the shareholders of the Globe as to the regularity of the meeting, one side claiming that it had been adjourned and refusing to vote, and the other claiming that the agreement with the United Company had been ratified. The result was that the dissatisfied shareholders went into the Court of Chancery for an injunction, which was argued before Mr. Justice Pearson on the 29th of July, who finally decided that the ratification was regular, because the stock which had attempted to vote had not been registered in time. This action leaves the United Company at the present time in virtual control of the field.

Another New Telephone.

CAPTAIN STONE TO STARTLE THE WORLD AS AN INVENTOR.

In order to get the facts regarding a new telephone soon to be introduced, the reporter on meeting Captain Stone, a vice-president and general manager of the Cincinnati Bell Telephone Company, at his office, corner Fourth and Walnut streets, said:

"You stand charged with inventing a new telephone that will astonish the world."

"Yes!" replied the Captain, "and the public at large. It will be known as the 'Eureka.' This telephone will wipe out all others when ready for public use. It will be a great favorite with private families for the reason that when perfected it will hitch up horses, saw wood, build fires, cook, wash and iron, do up stairs work, and keep babies quiet all night. It also has one quality that will make it a great favorite with gentlemen, it will reconcile wives to permit their husbands to 'paint the town red' once in every thirty days."

"Isn't that putting it a little extravagantly?"

"Not at all. There are two things you must consider. These instruments will cost no royalty, and are so simple in their construction that any child two weeks old can put them together, and the cost is so slight that the subscriber's expense is simply nothing. These telephones are operated with wind, without wires, batteries or poles. Mr. Hart, the shoe dealer on Fourth street, is negotiating for one hundred thousand of these telephones, to be given away to his customers."

"What distance will these wonderful telephones talk?"

"They will telephone as far as you can telegraph. Without any exaggeration the instrument is so perfect that you can hear a mosquito whisper 3,000 miles. An experiment was made the other day that gave very good satisfaction. A child four weeks old, in Cincinnati, carried on a conversation in four languages with its grandmother, 196 years of age, in New York; but this is nothing compared with its other qualities."

"When will you give this telephone to the public?"

"When it is completed. It is perfect now with but one exception. We are trying to make it speak the truth, and we find this more troublesome to accomplish than all else."

"Good day."

"Call again."—*Cincinnati Times Star.*

It is stated that the final hearing upon the Drawbaugh case has at last been fixed for September 15, at Syracuse, before Judge Wallace. After the arguments, the court will take the case under advisement as long as it pleases.

Cheap Telegraphy.

THE COMING COMPETITION OF THE BALTIMORE AND OHIO WITH THE WESTERN UNION.

An important suit was decided in Houston Tex., on the 14th instant, which directly affects the mercantile community, and will be a long step toward securing the greatly desired reduction in telegraph rates. The monopoly so long held by the Western Union will be broken up by the advent of the competing line, owned by the Baltimore and Ohio. This was a suit brought by the Baltimore and Ohio Company to acquire a right of way for their poles and lines along the line of the Texas and New Orleans Railroad Company from Houston to Orange, a distance of 105 miles. In 1874 the Western Union Telegraph Co. made a contract with the Texas and New Orleans Railroad Co., by which it was granted the exclusive right to operate telegraph lines upon this right of way. The Baltimore and Ohio Telegraph Company, being unable to agree with the Texas and New Orleans Railroad Company as to the amount of damage for the privilege of erecting poles and stringing wires along the right of way from Houston to Orange, brought suit to acquire the right of way. The case was tried yesterday afternoon in the law office of Jones & Garnett, before Commissioners Henry Brashear, W. Harral and O. H. Cochran. The railroad company appeared by Judge Crosby, the Western Union by Stewart & Breaker, and the Baltimore and Ohio by Gresham & Jones, of Galveston, and Jones & Garnett, of Houston. During the progress of the suit counsel for the Western Union contended that that corporation had a very favorable contract with the railroad company. Whereupon the representative of the Baltimore and Ohio offered to make a contract on the spot, giving the railroad company double the advantages and compensation it had with the Western Union. The result of the suit was to award the Texas and New Orleans road $300 damages for that portion of its right of way in Harris County, and $700 for that portion lying between the eastern boundary of Harris County and the town of Orange, a total of $1,000, which is between $9 and $10 per mile for the right of way. The Western Union was awarded no damages whatever.

Indications point to an early completion of the Baltimore and Ohio's telegraph line. The mercantile community will soon have a first-class telegraphic service at greatly reduced rates to all the principal cities of the United States and Europe. Messrs. Hall and McShane go to Dallas to-day to try a similar case for right of way over the Texas Central from Dallas to Sherman, which will be followed by another from Sherman to Texarkana. Similar proceedings will be held in other cities. The line of the Baltimore and Ohio is finished to Texarkana, and almost to New Orleans. From Sabine to New Orleans the line will doubtless soon be in operation.

The Organization of the Post and Telegraph Service in France.

Batteries.—Batteries have been the object of various experiments. The Marie-Davy battery has been improved by M. Beaufils, who is also a member of the French Administration.

Post and Telegraph Offices.—The number of our postal and telegraph offices was far from being in proportion to the wants, caused by the continuously growing increase of the correspondence. From that point of view France did not occupy a rank but below the one which she legitimately ought to lay claim to.

It therefore had become necessary to increase the number of our offices.

Post offices, the importance of which varies according to the wants they are intended to satisfy and the localities which they serve, are divided into three classes:

Main Offices, which include a postmaster and a certain number of clerks, under his orders, appointed by the Administration.

Auxiliary Offices, the postmaster of which alone is appointed by the Administration, and who may be assisted by one or several clerks, selected by himself; and finally,

Rural Offices ("facteurs-boîtiers"), where the postman is charged both with the internal office work and the house-to-house delivery of letters.

The number of postal offices, which in 1877 was 5,570, amounted on the 1st of January, 1884, to 6,486, of which 412 were main offices, 5,781 auxiliary offices, and 293 rural offices, or an increase of 916 offices, equal to 16 per cent.

The number of telegraph offices, which in 1877 was 4,541, amounted, on the 1st of January, 1884, to 7,523, comprising 784 head offices, 3,706 sub-offices, 2,533 railway offices, 176 offices connected with the service of the locks on rivers and canals, 125 signal stations (semaphores), and 199 private offices, or an increase of 2,982 offices, equal to 65 per cent. Amongst these offices, the number of those open both to the postal and telegraphic services amounts to 3,885, of which 3,162 have a municipal telegraph service. In 1877 the number of these amalgamated offices only amounted to 1,047.

In 1877 France possessed only one post office for every 6,625 inhabitants, and one telegraph office for every 8,127 inhabitants. At present these figures are 5,814 inhabitants per post office and 5,140 per telegraph office.

We regret that we have been obliged to

limit the opening of new postal offices to 150 in 1882, 150 in 1883, and 100 for 1884. The exigencies of the budget have compelled us to do this, but if permission could be obtained for a sacrifice, this certainly would be rewarded by a corresponding increase of receipts.

A list of the localities which apply for the opening of post offices is made out according to the importance of each application, which depends upon the population and the amount of the postal receipts of the parishes, eventually intended to be served by that office, the distance of this locality from the nearest office, etc. The post offices which are opened each year are taken from that list, as much as possible, according to the order they are entered thereon.

Formerly the Administration only admitted the claims of parishes which were at least four kilometers distant from the offices which served them. But we thought that this restriction was of such a nature as to injure the interests of important localities, and we have therefore abolished it in principle.

It is impossible to satisfy the petitions, the number of which increases every day; they amount, at present, to 1,600. Many localities find the daily service of the rural postman insufficient; ask for more deliveries; the means of replying the same day to letters received in the morning, or to send post office orders, etc., advantages which they cannot fully obtain unless they possess a post office.

It would not be possible to give satisfaction to these 1,600 petitions for post offices but by means of an expenditure of more than five millions, the opening of each postal office amounting to about 3,000 francs. We wish it were possible to open 500 offices per year during two or three terms; the correspondence of the country would thereby be greatly accelerated, and the State reap large receipts. The example of Great Britain proves this.

Statistics for 1882, recently published by the International Office of the Universal Postal Union, give the average population per post office in the different countries of Europe as follows:

Switzerland.	980	Austria	5,437
Great Britain	2,291	France.....	5,957
Sweden.....	2,455	Spain.....	6,302
Denmark ...	3,195	Belgium	6,391
Holland.....	3,235	Italy.....	8,175
Germany....	3,605	Russia	21,013
Portugal ...	4,597	Roumania...	25,200

This is the latest information we possess as regards the whole of the foreign countries, but we ought to add that, at present, the average population per postal office in France is 5,814 inhabitants, as we have stated before. Besides, it should be observed that a large number of Swiss, English, and German post offices are, properly speaking, only postal agencies, the managers of which are not officials of the State. Those agents intervene in the service in the same way as our dealers in tobacco, although in a much more extensive manner.

The average population per telegraph office in the principal countries of the Telegraph Union was, for 1882, as follows:

Switzerland .	2,301	Austria....	8,292
Germany....	4,817	Holland. ...	9,420
Sweden.....	5,556	Italy.....	11,178
France.....	5,962	Portugal....	21,341
Great Britain	6,141	Russia.....	31,772
Denmark....	6,268	Spain..	42,660
Belgium	6,476		

France, therefore, holds the fourth place, but as the average population per telegraph office in France at the present time amounts to 5,140 inhabitants, we may consider, allowing for the other countries a normal increase, that we now occupy the third place.

In order to satisfy the requirements occasioned by the development of the correspondence, since the reduction of the postal rates, and because of the continually increasing number of petitions for offices, a ministerial circular, dated the 31st March, 1879, offered new facilities to parishes that wished to obtain the auxiliary establishment of a municipal rural office until such time that, owing to their importance, they would be able to lay claim to a regular office, of which the law of supply authorizes the opening of a certain number yearly on condition of their refunding to the Administration the additional expenses resulting therefrom; besides, the parishes had to provide, free of cost, premises suitable for the work and the lodging of the official, as well as light and fuel.

Another circular, dated the 15th June, 1879, also offered to parishes the means of immediately obtaining the opening of a regular office on the same conditions and by payment of heavier dues.

The payment of these dues by the parishes in both cases to cease the day on which the increase of the postal receipts resulting from the opening of the office will allow of the State itself paying the expenses of that office.

Parishes that wish to do so can also obtain the opening of a telegraph service by assenting to special conditions.

These installations depend entirely upon the interested places themselves.

For some time, indeed, the State imposes upon itself heavy sacrifices for the development of the auxiliary telegraph system. When, in 1864, the administration undertook the organization of that system, it could not do this at the sole expense of the State, as the receipts produced by the municipal offices for many years would remain below the sum necessary to cover the cost of first outlay and the working expenses.

It adopted a benevolent system by charging the State with a large part of those costs of establishment and by requiring parishes that wished to have municipal telegraph offices to contribute to the cost of constructing lines, at the reduced rate of 120 francs per kilometer of new line to be erected, and at 60 francs per kilometer of line to be put on existing poles.

The State, in reality, thus granted a large subvention, which was exactly in proportion to the losses which the parishes agreed to make themselves, and consequently to the real wants of the populations.

In 1876, when a very considerable number of the principal towns of the districts were not yet in possession of municipal telegraph offices, it was feared that it would be impossible to meet all the petitions, and the conditions imposed on parishes which were not principal towns of districts were augmented by a guarantee of minimum receipts of 500 francs per year.

Exception to this rule was made only in the case of those parishes that were the seat of a brigade of police. A fixed contribution of 500 francs for purchasing the instruments had to be paid by all parishes that were not principal towns of districts.

This rule, exceptionably favorable to the principal towns of districts, was intended to assure to them priority in the opening of municipal telegraph offices.

We thought that because of the considerable development of the telegraphic correspondence it became necessary to place the telegraph more and more at the disposal of the public in the smaller localities. The law of the 18th June, 1880, abolished the guarantee of yearly receipts of 500 francs as imposed by the law of 1876.

Under this new rule we were able to satisfy all the petitions for municipal telegraph offices made by parishes that had fulfilled the necessary conditions. A further result was the possibility for parishes to act in concert with each other and to establish telegraph lines jointly.

A decree dated the 11th February, 1882, yet further reduces the payments to be made by parishes for the establishment of a municipal telegraph office; the contribution to the cost of erecting the lines has been decreased from 60 to 50 francs per kilometer of wire to be placed on existing poles, and from 120 to 100 francs per kilometer of new line to be constructed. Besides, this contribution is reduced by one-half for the principal towns of districts, the number of which is fixed every year.

This decree has given a sudden impulse to the extension of the municipal system.

A great number of parishes were active in profiting by those benevolent arrangements. From 1878 till 1881, 796 municipal offices have been opened. In 1882, 1,315 projects for the opening of municipal offices have been under consideration. Five hundred offices, 186 of which were situated in principal towns of districts, have been opened. Since the 1st January, 1883, 538 new offices, 151 of which are in principal towns of districts, have been opened, and this number might have increased to 600 in the course of 1883 if we had not been kept back by the insufficiency of our vote of credit.

The number of principal towns of districts not provided with a municipal telegraph office, which in 1877 amounted to 1,324, is at present only 160.

The State has imposed heavy sacrifices on itself. The Government has not ceased to extend as much as possible the municipal telegraph system, but the completion of this system, above all, depends on the parishes themselves.

A certain number of "*conseils generaux*" have already come to the assistance of the parishes, and share in the expenses of establishing the offices. We cannot congratulate them enough on their initiative in giving an example which it would be well for the other departments to follow.

The impossibility of certain parishes to pay the expenses required for the opening of a municipal telegraph office, coupled with the anxiety of the Government to supply this deficiency in such parishes, have suggested the idea of employing, for the benefit of private telegraphy, certain wires, established for special purposes, such as at railway stations, at offices for the service of the locks, and at semaphores.

This service, however, is far from offering the advantages of the offices of the Administration. At railway stations messages have to pay an extra charge of 40 per cent. for the benefit of the companies; their transmission is subordinate to the requirements of the railway service; it is made by a staff generally less experienced, and only having at their disposal instruments which often are insufficient; their delivery is only free within the station of arrival itself. Finally, the Administration has no control over those offices, and cannot accept the responsibility of any complaints to which they may give cause.

However, even under those conditions, this service is of great benefit to places which are without any special telegraph office; 2,533 railway stations are open to private telegraphy. The telegraph system of the railways is accordingly connected with that of the State, and a recent decision has authorized the interested municipalities to have the municipal offices connected with the corresponding railway stations at their own expense.

The special telegraph systems which are used at the locks for the service of the navigation on the rivers and at the semaphores for that of the sea coast navigation are, for the greater part, also placed at the disposal of the public under similar conditions.

It is, and we must repeat it, only an expedient to the insufficiency of which we cannot fail to call the attention of the interested parishes.

Numerous improvements have been introduced in the service of the offices. It would be too long to give them here in detail. We will limit ourselves to mentioning the transformation of offices, performing limited day duty, into offices performing full day duty; the assimilation of the hours of opening and closing for postal work, with the hours of the telegraph service in the amalgamated offices; the right granted to towns to obtain the prolongation of the telegraph service, either till midnight, or even during the whole night (the towns of Lille, Nice, Clermont-Ferrand, Amiens, le Mans, Valence, Grenoble, Pau, Perpignan, Dijon, Cherbourg, Carcassonne, Narbonne, Angers, Beziers, Saint-Quentin, Valenciennes, Versailles, Troyes, Roubaix, Cambrai, Montauban, Douai, Laval, Aix-en-Provence, Elbeuf, Tourcoing, Ajaccio, Rochefort, Vienne, Cannes, and Neuilly-sur-Seine have availed themselves of this); the numerous increases in the staff of the offices, and, finally, the opening of new "*guichets*," intended to avoid, as much as possible, any delay in receiving messages from the public. —*London Electrical Review.*

TELEGRAPHIC

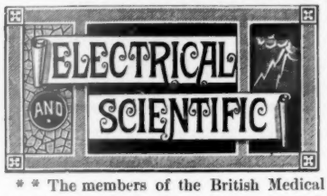
.... The monster works of Krupp, at Essen, the birthplace of many a score of cannon, employ no less than 20,000 work-people. There are also in use there 439 steam boilers, and 450 steam engines representing 185,000 horse-power. In addition to 40 miles of rails, 28 locomotives, and 69 horses, Herr Krupp has pressed into his service 40 miles of telegraph wire, which run between 35 stations, and 55 Morse instruments.

... Mail advices state that the Minister of the Interior of Chile, S. A., has submitted his report to Congress for the year ended March 1st, 1884. It appears that in 1883 there were constructed 660 kilometers of new telegraph lines, which brings up the total length of the State wires to 9,603 kilometers. The number of telegrams, exclusive of official messages, transmitted in 1883 was 393,781 as against 348,161 in 1882. The number of words contained in the telegrams transmitted in 1883 was 5,535,277 as against 4,925,862 in 1882; and the receipts amounted to $116,250 as against $105,166 in 1882.

.... On Wednesday night last a fire was discovered behind the switchboard in the main office of the Western Union Telegraph Company, in Cleveland, O., and before the operators had time to realize the situation, the flames had spread over their heads, and the entire room was a sheet of fire. The flames shot up through the tower, through which the wires pass, and everything was completely destroyed. The switchboard is a complete wreck. The flames encircled the entire room, and destroyed the tables and instruments, among which were the duplex, quadruplex and gold and stock. The cause of the fire is unknown, but it is supposed to have originated from a cross between some of the wires.

.... The extent of electric telegraph wire in New South Wales, Australia, in actual use during 1882 was 15,901 miles 47 chains 13 links; the number of stations was 345; the revenue for the year, £120,265 13s. 4d.; and the expenditure (exclusive of interest on cost of construction of lines), £142,534 13s. 6d. In 1883 the extent of electric telegraph wire in actual use was 17,272 miles 41 chains 35 links; the number of stations, 368; the revenue, £134,643 2s. 4d.; and the expenditure (exclusive of interest on cost of construction of lines), £163,328 16s. 11d.; 2,167,288 telegrams, of the value of £165,276 14s. 10d, were transmitted from the colony; and 2,102,044 telegrams, of the value of £159,095 2s. 1d., were issued in the colony. The New South Wales receipts on local and inter-colonial (exclusive of New Zealand) business were £122,891 0s. 7d.; on New Zealand business, £1,898 15s. 1d.; and on international business, £3,049, making the total receipts £127,838 15s. 8d.

.... The fast-sending tournament of telegraphers took place in the dining-room of the Western Union building recently. The test was the transmission of 500 words of selected printed matter, the points to be considered being rapidity, correctness and perfection in forming the Morse characters. There were ten contestants, representing every telegraph company in the city and the United Press. The prize winners were as follows: First—W. L. Waugh, Commercial Telegraph Company, rapidity and perfect manipulation, gold medal; time, 11 minutes 27 seconds. Second—W. M. Gibson, Bankers and Merchants' Telegraph Company, good but not perfect sending, silver medal; time, 11 minutes 3 seconds. Third—F. J. Kilim, United Press, fair formation of characters but great speed, silver plated key; time, 10 minutes 32 seconds. Several of the contestants transmitted the matter in less time than any of the winners, but were debarred by imperfect transmission. In one instance the 500 words were gone over in 10 minutes 10 seconds, but the sending not being readable it failed to secure a prize.



* * The members of the British Medical Association concluded their meeting at Belfast by a series of excursions, many hundred members paying a visit to the Portrush Electric Railway, and traveling to the Giant's Causeway by it.

* * Recent London papers state that some gorgeous sunlight effects had again been observed over the Yorkshire Wolds. For several nights past the sky had been one mass of richly-blended colors, commencing at the horizon with a broad belt of deep yellow light, and then band above band of orange and purple, the latter color predominating in horizontal streaks, whilst up to the zenith the heavens were flooded with a magnificent glow from the setting sun.

* * The lady had just finished reading an account in the *Bulletin* of the Edison display, when she laid the paper down with an expression of horror. "I see that Edison is going to put in a 30-ton dynamo; I don't think that should be permitted," she said. After meditating a while the danger seemed to be even more serious, and the protest was emphatic: "Suppose some horrid fellow should throw a lighted cigar into this; why, 30 tons of dynamite would blow up the town!"

* * The discovery of the way to make the beautiful rainbow-tinted iridescent glass is said to have been, like many other inventions, quite accidental. The workmen of a Bohemian glass manufacturer—the story goes—wishing to celebrate their master's return home from a journey, kindled some Bengal lights in the annealing evens. What pieces of glassware were in the ovens became iridescent. The same effect is now produced by a similar process. While the glass is hot, and before it is put in the annealing furnace, a vapor is passed over it, the product of a mixture of proto-chloride of tin, carbonate of baryta, and carbonate of strontian.

* * With the progress and growth of electrical research and discovery there have grown up a number of men, more or less deserving the title, who are called electrical experts, and to whom those in search of exact information on matters electrical, or the solution of some electrical problem, are forced to turn. They are graduates of the school of experience. What they know has been picked up by reading and by experiment, and the best of them to-day are men who never took an electrical course in any school or college, for the very simple reason that in their student days no such thing as an electrical course, really deserving the name, existed in any institution of learning. By a process of natural selection they have come to the surface, because of the aptitude they have shown in one branch or another of electrical research, and the proof of their capacity, instead of resting on the diploma of a college, is to be found in their work.

* * The time will come, of course, and that shortly, when the various scientific schools will be sending out more or less electrical engineers every year, just as they are now graduating civil and mining engineers—young men fully and thoroughly equipped with an exact knowledge of all that is known of the science, ready to answer promptly any reasonable question in any part of the domain of electrical science. They may not be geniuses, but they will at least be valuable storehouses of electrical knowledge, ready to be drawn upon at any time—for a consideration. It is one of the weak points in electrical interests to-day that, with a few honorable exceptions, we have no such men. Pretty much all who figure as electrical experts are in reality inventors, who, of necessity, have made the science a study, but always with the same distinct end in view, so that their knowledge, though highly useful and valuable, is restricted in its range, rather than broad and catholic.

* * A French paper says that the railway companies are about to try an electric gate opener. The method is as follows: A catch connected with an electro-magnet keeps the gates closed. An approaching train closes the circuit at a certain distance from the gates, the catch is released, and the gates open. When the last car has passed, the circuit is broken again, and the gates close. A bell is also rung as the train approaches.

* * Charts of the geographical distribution of the lightning strokes for 1882 and 1883, prepared from our fire records, says the *Insurance Chronicle*, show that they are chiefly confined to that part of the country situated north of the Ohio river, and east of the Missouri river. In both years 85 per cent. of all the strokes occurred within this area. In the Southern States lightning seems to be comparatively rare, and seldom occurs outside of three States—Texas, Louisiana and Georgia. There seems to be two principal centers of electrical disturbance, from the fire underwriter's standpoint, and these are in the New England and Northwestern States. Sixty-five per cent. of the strokes happen in the summer; the remaining 35 per cent. are divided between spring and autumn in about equal proportions.

* * Messrs. Tommasi and Radiguet have brought out a new carbon battery. It is composed of a rectangular basin of porcelain, at the bottom of which is placed a carbon plate surrounded by a paste of peroxide of lead, forming one of the electrodes. The other electrode is formed by a second plate of carbon similar to the first, but containing in its upper part fragments of platinized retort carbon. These two plates are placed one on the other, and separated by a piece of parchment paper so arranged as to divide the basin into two perfectly separated compartments. To make the battery work, a small quantity of saturated chloride of sodium solution is poured into the compartments in such a way as on one hand not to hinder the peroxide of lead too much, and on the other so that the fragments of carbon covering the upper electrode shall be only partly in the solution. This battery, which works only when the circuit is closed, gives an E. M. F. of .6 volt. The negative pole (the zinc of ordinary batteries) is formed by the carbon plate, which does not touch the peroxide of lead. If for the solution of chloride of sodium other salt solutions such as sulphate of ammonia, sulphate of soda, chlorhydrate of ammonia, or even weak sulphuric acid be substituted, the E. M. F. does not sensibly vary.

* * A recent writer in the *North China Herald* discusses the part played by mercury in the alchemy and *materia medica* of the Chinese. Cinnabar was known to them in the seventh century before the Christian era, and its occurrence on the surface of the earth was said to indicate gold beneath. Their views on the transformation of metals into ores and ores into metals by heat took the form of a chemical doctrine about a century before Christ, and there is now no reasonable doubt that the Arabian Geber and others (as stated by Dr. Gladstone in his inaugural address to the Chemical Society) derived their ideas on the transmutation of metals into gold and the belief in immunity from death by the use of the philosopher's stone from China. Among all the metals with which the alchemist worked, mercury was pre-eminent, and this is stated to be really the philosopher's stone, of which Geber, Kalid, and others spoke in the times of the early Caliphs. In China it was employed excessively as a medicine. On nights when dew was falling, a sufficient amount was collected to mix with the powder of cinnabar, and this was taken habitually till it led to serious disturbance of the bodily functions. In the ninth century an emperor, and in the tenth a prime minister, died from overdoses of mercury. Chinese medical books say it takes two hundred years to produce cinnabar; in three hundred years it becomes lead; in two hundred years more it becomes silver, and then by obtaining a transforming substance called "vapor of harmony" it becomes gold. This doctrine of the transformation of mercury into other metals is 2,000 years old in China. The Chinese hold that it not only prolongs life, but expels bad vapors, poison, and the gloom of an uneasy mind.

* * Sir William Thomson, the great English scientist, arrived here on the steamer Servia last week. He is the son of the late William Thomson, LL.D., professor of mathematics at the University of Glasgow, and was born at Glasgow in 1824. He was educated at Peterhouse, Cambridge, and was graduated in 1843 as second wrangler. In 1846 he was appointed professor of natural philosophy in the University of Glasgow, and a few months later became editor of the Cambridge and Dublin Mathematical Journal. His main contributions to science have been made between 1850 and the present time. They consists of papers on "The Distribution of Electricity in Spherical Conductors," "Electrodynamic Properties of Heat," "Thermal Effects of Fluids in Motion," "Mathematical Theory of Electricity," "Rigidity of the Earth," "Determination of a Ship's Place at Sea from Observations of Altitudes," "Approach Caused by Vibration," and on other scientific subjects. He is also the inventor of the mirror galvanometer and the siphon recorder.

In 1866, on the completion of the Atlantic cable, he was knighted and presented with the freedom of the city of Glasgow. The universities of Glasgow, Dublin, Cambridge, Edinburgh and Oxford subsequently conferred upon him the honorary degree of Doctor of Laws. He is also a fellow of the royal societies of London and Edinburgh, and received from the former the royal medal, and from the latter the Keith prize. In 1871 he was president of the British Association, which met in Edinburgh, and in 1872 of the Geological Society, which met in Glasgow. In 1873 he was appointed foreign associate by the Paris Academy of Sciences, and in 1881 presided over the section of the mathematical and physical sciences in York. The latest appointment held by him was that of British commissioner for the electrical exhibition held at Vienna in 1883.

Sir William's visit to this country is for the purpose of attending the congress of electricians which will be held in September at Philadelphia.

* * As the day approaches when the Electrical Exhibition will be opened to the public, a widespread interest is shown in the preparations for what will, undoubtedly, be the most varied and complete display of the applications of electricity to the arts that the world has ever seen. The exhibition, which opens on September 2d, and continues until October 11, is expected to surpass those held at Paris, Munich and Vienna, both in the number and diversity of the things to be seen and in its scientific results. As it is given an international character by the action of Congress in calling a national conference of electricians and in appropriating $25,000 for the expenses of the Supervising Commission, it is probable that President Arthur will attend the opening exercises; but this is not yet certainly decided.

As is well-known, the exhibition was originated and will be given under the direct auspices of the Franklin Institute. The building which is to contain most of the articles shown, at Thirty-second Street and Lancaster Avenue, is already practically finished, although its interior presents now a scene of confusion. Carpenters are at work preparing the spaces for exhibitors, and putting finishing touches here and there. Yesterday a gaping crowd watched the perilous process of placing lightning rods upon the four towers, which rise sixty feet above the ground, while the rods run twenty-eight feet above the apex of each tower. Workmen are painting the roof, and others are placing in position some of the first of the exhibits, while others are busy about the fountain in the center of the main hall. Out of all this confusion, order will soon come, and the advanced state of the work warrants the belief that almost every article will be in its place by the opening day.

The plan of the building is simple. It consists of a central hall, covered by an arched roof 100 feet span and 200 feet long, while two smaller halls run parallel with it, all three extending from Thirty-second to Thirty-third Street. Joined to these halls is a triangular building of one story, which fills the rest of the space between the halls and Lancaster Avenue. On the other side of the central halls is the boiler room, near which most of the engines and dynamos will be placed. A gallery runs around the main hall below the base of the arched roof, which is connected with the main floor by broad stairways, and which will be filled with exhibits. A large Roosevelt organ will be placed at the eastern end of this gallery, which will be played by electricity, the keyboard being below, near the center of the main floor. With the exception of the gallery, all the exhibits will be on the same floor, and, as all the halls are open, the effect is that of one immense building. Across Thirty-second Street an enclosed space will connect the main building with the old Pennsylvania Railroad station, where will be the restaurant, the lecture room and many of the larger exhibits, including two, or perhaps, three electric railways in operation.

The exhibition itself will cover the entire field of electricity in its scientific phases and practical applications. First should be mentioned, as one of its most permanent and valuable results, the display which will be made of the literature of electricity. This is to include both ancient and modern treatises, and many valuable reprints of the proceedings of scientific societies, which could only be found, unless thus collected, by long research through many ponderous volumes. Most of these books will be presented to the institute; but many old works, now out of print and very rare, will be purchased with a special fund raised for that purpose. After the exhibition this collection will be placed in the Franklin Institute, under the title of "The Memorial Library of the International Electrical Exhibition," and will be used for reference only.

The Buell Automatic Alarm and Fire Extinguisher.

The uses of electricity in sounding fire alarms have long been known, all large cities now being furnished with systems considered by the general public as near perfection as can be approached. It requires, however, only a study into the workings of the Buell Automatic Fire Alarm and Extinguisher system to convince one that it is simply a question of time when the present devices for sounding alarms will be greatly modified, or become as obsolete for future uses, as would be the first steam engine or the first steamboat to meet the demands of modern travel. A thermostat of simple and novel construction forms the key of the alarm apparatus, which will be connected with a central station. This thermostat is composed of two plates of spring brass soldered together, with a fusible metal, the plates being a little sprung in soldering, so that the joint will separate on the softening or melting of the solder, a heat of about 160° Fahrenheit being required. This done, an alarm is sounded, which indicates the exact floor of the building where the fire occurs. This can, of course, be known at every point where connections are made—at the office and throughout the building, at a central office, and at engine houses, etc. The system can be used with or without sprinklers, according to the character and location of the building. When the extinguishers are attached the water is forced only through the sprinkler in the immediate vicinity of the fire, the spread of the latter regulating the action of the others. An important improvement at this point should be mentioned. The water does not remain in the pipes unless desired, but can be let on simultaneously with the alarm by automatic action, by a valve connected with an ingenious mechanism in the basement or any other desirable part of the building. Thus is all danger from the freezing of pipes in cold weather, the liability to flooding by injury to the sprinklers, etc., entirely obviated. The separate action of each sprinkler, (no

more than the requisite amount of water being discharged and that on the right spot), also prevents the unnecessary flooding of buildings, by which greater damage than that caused by fire often occurs. Any injury to the wires, thermostats or other portions of the apparatus is instantaneously announced by a peculiar alarm, and the good condition of the system is thus always ensured. These advantages—the protection against freezing and leakage and the certainty with which the slightest damage can instantly be detected—remove any and all grounds of objection which can be urged against the introduction of the automatic system into the best class of structures or those filled with stocks of valuable goods and high cost materials.

The protection of hotels, which are burned at the rate of 350 per year, or one a day, in this country, becomes a very important consideration. With the introduction of the Buell system these catastrophes, with the attendant loss of life, by which the public is so frequently horrified, would seem to be practically impossible. With the wires reaching every room of a hotel, the closets, storerooms, etc., the beginning of a fire and the precise locality is immediately indicated at the office, or elsewhere if necessary. Thus precious time is not wasted in seeking for it when the smell of smoke gives warning of danger, but even before its presence is known the faithful thermostat may give information, and, should the danger become imminent, a general alarm can be sounded so that the occupants of every room may escape. The Buell system has been placed in the immense establishment of Messrs. Jordan, Marsh & Co., several miles of wire being required to protect their extensive buildings on every floor, from basement to roof, and their emporium may be considered as securely guarded against conflagration from within as any similarly constructed building in existence. It also protects the new Roberts building in Chardon street, and since the organization of the company, two months ago, active negotiations have been in progress to place it into many other buildings in New England, including valuable hotels, mills, stores and manufactories. As a matter of expense this valuable protector must in time pay for itself in the saving of insurance rates alone, for wherever it is properly introduced the Boston Fire Underwriters' Union allow a reduction of 5 to 25 per cent. on the rates.

At the company's factory in Woburn, the writer witnessed the workings of the Buell system, and became more than ever impressed with the great efficacy and importance of the use of the automatic fire alarm. The walls and ceilings of the different rooms are strung with wires about 10 feet apart, the thermostatus being located in different positions. The result of a lighted match placed underneath one of the latter for a few seconds was truly remarkable. The different alarms, indicating the number of the floor, sounded as if by magic, the valve in the engine room opened to let the water into the pipes, and the impossibility of a fire getting headway from the interior of this building was at once demonstrated.

European Engineering Schemes.

Two great engineering schemes are now attracting attention in Europe. One is the proposal to pierce a railway tunnel through the Pyrenees, the convention for which has just been signed by the French and Spanish International Railway Commission. The other scheme is for the formation of a company to construct an international railway connecting Europe with Persia, India, Burmah and China. It appears that Sir R. M. Stephenson, who has been endeavoring to arrange with the Sublime Porte for the commencement of the works in Turkey for the last thirty-four years, considers that the negotiations are so far advanced as to warrant the formation of a company to work the concession, which he believes he will eventually obtain. He proposes to raise, for making the Asia Minor and Persia sections, a capital of $80,000,000, in 600,000 shares of $400 each, "of which it is proposed $20,000,000 shall be saved by troops' labor leav- $60,000,000 to be subscribed." Sir R. M. Stephenson hopes to induce the countries through which the line passes to supply troops to make it.

The changes which thermometers undergo when heated for a long time have received the attention of the French Academy of Sciences. It appears from investigations made in this line that in manufactories of printers' ink, where oils are heated to a temperature of some 538° F. for many days, the most accurate thermometers often become so changed as to indicate errors of ten or more degrees. Similar changes of much lower temperatures are also mentioned. Thus the aerometers, which are employed in sugar refineries, where the molasses is treated by osmosis, are plunged for many days in liquids which are heated to 203° F., and although this temperature is below the boiling point of water, it is found sufficient to completely modify the aerometers and to soften the glass enough to render them untrustworthy.

The Induction Spark in Analysis.

An interesting application of the induction spark in analyzing benzine, toluene, and aniline has been made by M. Destrem, and brought before the French Academy of Sciences. The apparatus used was an electro-analyzer of Hoffmann, with a medium-sized induction coil actuated by three Bunsen elements. The spark was taken between two platinum electrodes immersed in the liquids under test. Soon after it begins to pass, bubbles of gas form round the electrodes and carbon soot is separated from the liquid. In aniline there is less carbon liberated and it falls to the bottom more quickly than in the other two liquids mentioned. In the gaseous mixture coming from the decomposition of these carbonaceous substances, M. Destrem finds for benzine acetylene 42 per cent. to 43 per cent., hydrogen 57 per cent. to 58 per cent.; for toluene acetylene 23 per cent. to 24 per cent., hydrogen 76 per cent. to 77 per cent; for aniline acetylene 21 per cent, hydrogen 65 per cent., cyanhydric acid 9 per cent., and nitrogen 10 per cent. After the action of the spark he finds besides the carbon deposit from the benzine and toluene, some diphenyl and a reddish brown paste, soluble in the carburates, which is easily isolated, either by concentration or cooling.

Conductivity of Metals and Alloys.

M. Lazare Weiller has conducted a new and independent investigation into the electrical conductivity of certain metals and alloys, the results of which he lately presented to the Société Internationale des Electriciens. For the purposes of his experiments, he caused small bars of metal to be cast of a diameter of about 13 mm. (0.51 in.). These were divided in such a way as to show the grain of the fracture, and one part was drawn into wire to be used in the trials. Those alloys which can neither be drawn nor rolled easily, such as silicides and phosphides, were tested directly on the cast bars after the method of Sir William Thomson. In the trials, the bars, fitted with binding screws at each end, rested upon knife edges at an invariable distance apart. These knife edges were respectively in communication with two resistances composed of two parts, of which the one was the thousandth part of the other. The extremity of one was connected to the fixed terminal of a Wheatstone bridge with a sliding contact, and the other to the slider itself. The two points which separated the resistances communicated with the galvanometer. Finally the extremities of the bridge were connected to the binding screws by means of a circuit, which included a battery of four elements and a contact key. The resistance sought was then equal to the resistance measured upon the wire of the bridge, divided by 1,000. The measurements, which were very carefully and accurately conducted, and were effected on a great number of specimens, were made in part by M. Weiller himself, and in part by M. Duflon, in the laboratory of Messrs. Breguet. The results are given in the following table, published recently in *Engineering*:

1.	Pure silver	100
2.	Pure copper	100
3.	Refined and crystallized copper	99.9
4.	Telegraphic silicious bronze	97
5.	Alloy of copper and silver (50 per cent.)	86.65
6.	Pure gold	78
7.	Silicide of copper, with 4 per cent. of silicium	75
8.	Silicide of copper, with 12 per cent. of silicium	54.7
9.	Pure aluminium	54.2
10.	Tin with 12 per cent. of sodium	46.9
11.	Telephonic silicious bronze	35
12.	Copper with 10 per cent. of lead	30
13.	Pure zinc	29.9
14.	Telephonic phosphor-bronze	29
15.	Silicious brass with 25 per cent. of zinc	26.49
16.	Brass with 35 per cent. of zinc	21.55
17.	Phosphor tin	17.9
18.	Alloy of gold and silver (50 per cent.)	16.12
19.	Swedish iron	16
20.	Pure Banca tin	15.45
21.	Antimonial copper	12 7
22.	Aluminium bronze (10 per cent)	12.6
23.	Siemens' steel	12
24.	Pure platinum	10 6
25.	Copper with 10 per cent. of nickel	10.6
26.	Cadmium amalgam (15 per cent.)	10.2
27.	Dronier mercurial bronze	10.14
28.	Arsenical copper (10 per cent.)	9.1
29.	Pure lead	8.88
30.	Bronze with 20 per cent. of tin	8.4
31.	Pure nickel	7.89
32.	Phosphor-bronze with 10 per cent. of tin	6 5
33.	Phosphor-copper with 9 per cent. of phosphorus	4.9
34.	Antimony	3.88

The resistances are not given in ohms, but as proportions to a given body. They may be reduced to the conventional standard on the assumption that a wire of pure silver, one millimeter in diameter, has, at a temperature of zero Cent. a resistance of 19.37 ohms per kilometer.

Another Exhibition.

An exhibition which includes many electrical appliances, and which is lighted by electric lamps, was opened at Steyr, in Upper Austria, on Saturday last by the Archduke Charles Louis. The motive power for the electric light machinery is derived from water wheels, and we hope that the opportunity will be taken of obtaining reliable figures as to the cost and effectiveness of this much talked-of source of energy.

—— Mr. Lowry, general master mechanic of the Chicago, Milwaukee and St. Paul Railway, in reply to a letter of inquiry says: "We are experimenting with what is known as "Woolley's Patent Electric Head-light," and for your information I will add, the engine and dynamo are placed on the running board on left-hand side of the locomotive, opposite air-brake pump, which is located on the right-hand side. They (engine and dynamo) occupy a space 34″ in length by 10″ in width. The dynamo is 18″ square by 10″ high. The armature is made up of disks, and is 12″ long by 6″ in diameter. The power is furnished by a small rotary engine, built by the Noteman Engine Company of Toledo, Ohio, which runs 600 revolutions per minute. The engine is connected to the shafts of the armature direct, the governor being on the opposite end of the shaft. There are no belts or gears of any kind. The dynamo is closed, so that it cannot be injured by the weather, etc. The lamp used is a focusing arc lamp, with an ordinary locomotive reflector. The lamp is made so that it can be regulated from the cab of the locomotive. The light is a good one; it is claimed it will penetrate so far into darkness that, should the track be obstructed from any cause, a locomotive, with the light on it, running at the rate of fifty miles per hour, an obstacle can be discovered sufficiently ahead that the locomotive can be stopped in time to avert a disaster. I might add, further, the machines are built by the "Woolley Locomotive Head-Light Company, Indianapolis, Ind. The power of the lamp I have referred to is 2,000 candle-power. It has an attachment to counteract any quick movement, so that any sudden jar of the locomotive does not affect the light in the least.

ELECTRIC LIGHT NEWS

—— The elevators of Budapest, Austro-Hungary, are to be lighted with electricity.

—— Ithaca, N. Y., has been lighted by 89 gas and 153 naphtha lights. Hereafter it will be lighted by the Brush-Swan system of electric light, by seventy electric lights. It pays $100 a year per light for two hundred and fifty nights from lighting time to midnight. The contract is for three years.

—— The Swiss Electrical Company have lighted the Cantonal Hospital at Lausanne on the Edison system. The installation comprises 236 lamps and three dynamos, the latter being driven by three turbines. The company also have a central station in the same town, where there are two dynamos driven by two turbines of 35 horse-power each. These supply current to 280 lamps.

—— A trial of incandescent lighting is now being made in the London and North-Western line. A locomotive running one of the trains between Liverpool and Manchester has been fitted with a Brotherhood engine and a dynamo, the latter supplying the requisite current to a Swan lamp in each of the compartments of the train. A duplicate lamp is also provided, and so arranged that it would be switched into the circuit directly the other lamp went out. The current is regulated by a switch, a pilot lamp indicating to the driver the candle-power at which the lights are burning.

—— As to the reliability of the electric light as an artificial illuminant little need at the present moment be said. It is true that in the early history of the art, great annoyance and inconvenience resulted from the unexpected extinguishment of all the lights in a circuit. Recent improvements, however, have been made which effectually prevent the extinguishing of one light from at all affecting the others that are placed in the same circuit with it. Systems of electric lighting have been in constant commercial use for several years without any greater inconvenience than has been experienced for a similar period of time in the case of gas lighting.

—— The electric light was very extensively used in the Queen's College, Belfast, during the recent sittings of the British Medical Association. The magnificent library, which stands apart from the main building, was beautifully lighted (for the first time since its erection on account of the risk of injury to the books by the use of gas) by incandescent lamps arranged in a continuous line around the balcony, which brought out in a very fine manner the architectural design of the building. Two of the reading rooms attached to the library were also lighted by the same means, one serving as a small refreshment room, the other being the office of the editor of the daily journal. The refreshment room, situated at the further extremity of the college, was illuminated by a large electrolier suspended in the center of the room, while incandescent lamps also served to illuminate the corridors, cloisters and staircases, etc., while, on the night of the *conversazione* a row of 10 candle-power lamps was used with good effect as foot lights to the temporary stage erected in the library. The lighting of the main portion of the building was effected by arc lamps which were placed in the main hall of the college, the large examination hall, and the museum, while the grounds were also lit by the same means. Among various concerts, exhibits, experiments, &c., provided for amusement, the projection on the screen of the electric arc, as also the spectrum of blood by Professor Letts in the chemistry room, attracted a very large number of visitors. The current for the incandescent lamps was supplied direct from a Victoria dynamo, driven by a gas engine, while the arc illumination was effected by Belfast lamps, and a series-wound, direct-current Newton dynamo, driven by steam.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 19, 1884.

303,614 Electric lamp; Emil Boettcher, Leipsic, Germany.

303,620 Regulator for fluid motors for dynamo-electric machines; Hippolite Louis Guillaume Clerac and Pierre Georges Ramire Gueroult, Paris, France, assignors to Société Anonyme des Ateliers de Construction Méchanique et d'Appareils Electriques, same place.

303,626 Electrical call device; William P. Curl, Ardmore, Pa., and James H. Curl, Elwood, N. J., assignors by mesne assignments to said inventors and Henry D. Hughes, Radnor, Pa.

303,627 Telephone transmitter; Daniel Drawbaugh, Eberly's Mills, Pa., assignor to People's Telephone Company, of New York.

303,628 Telephone transmitter; Daniel Drawbaugh, Eberly's Mills, Pa., assignor to People's Telephone Company, of New York.

303,629 Telephone; Daniel Drawbaugh, Eberly's Mills, Pa., assignor to People's Telephone Company, of New York.

303,714 Telephone exchange system and apparatus; Horace H Eldred, New York, N. Y., assignor by mesne assignments to the Western Electric Company, Chicago, Ill.

303,735 Electrical conductor; Charles T. Jackson, New York, N. Y.

303,744 Dynamo-electric machine; Jos. Olmstead, Brooklyn, N. Y., assignor to the Olmstead Electric Light Company, of New York.

303,749 Device for laying conductor wires in underground conduits; William Pyle, Wilmington, Del.

303,762 Electric arc lamp; Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut.

303,809 Telephone; Albert F. Congdon, Philadelphia, assignor to William Rennyson, Norristown, Pa.

303,810 Transmitting telephone; Albert F. Congdon, Philadelphia, assignor to William Rennyson, Norristown, Pa.

303,862 Thermostat; W. J. P. Kingsley and Geo. Lyle Kingsley, Rome, N. Y.

303,866 Regulator for dynamo-electric machines; John W. Langley, Ann Arbor, Mich., assignor to George H. Lothrop, Detroit, Mich.

303,877 Insulator-supporting bracket for electric wires; Charles Neblett, Cincinnati, O.

303,881 System for transmitting and distributing electrical energy; William Anthony Shaw, Brooklyn, assignor to Electrical Accumulator Company, New York, N. Y.

303,898 Electric arc lamp mechanism; Elihu Thomson, New Britain, Conn, assignor to the Thomson-Houston Electric Company.

303,911 Self-registering electric target; John Boone, Syracuse, N. Y., assignor to Ralph B. Strong, same place.

303,924 Electrical cable; Francis P. Duplain, Chicago, Ill., assignor by mesne assignments to the Western Electric Company, same place.

303,948 Speaking telephone transmitter; Thomas J. Perrin, New York, N. Y., assignor to Charles P. Huntingdon.

303,956 Automatic circuit closer for telegraph keys; Amos A. Stoneburner and Jakob H. Kasper, Dyer, Ind.

303,959 Electric bathing cabinet; Ludwig von Dolcke, Cincinnati, O.

303,961 Clip for aerial electric cables; Augustus Wright, Providence, R. I.

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BUSINESS NOTICES.

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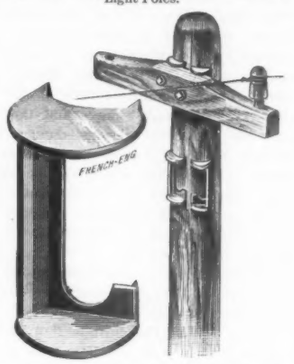

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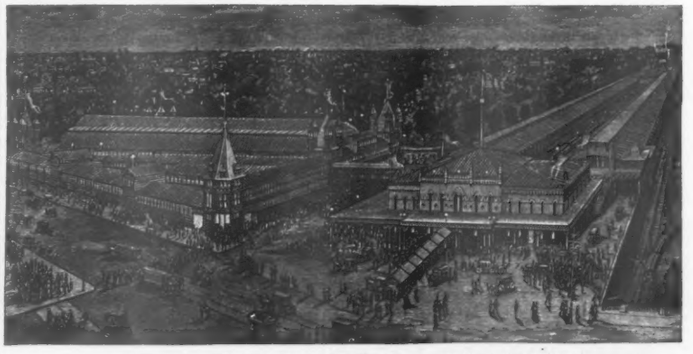

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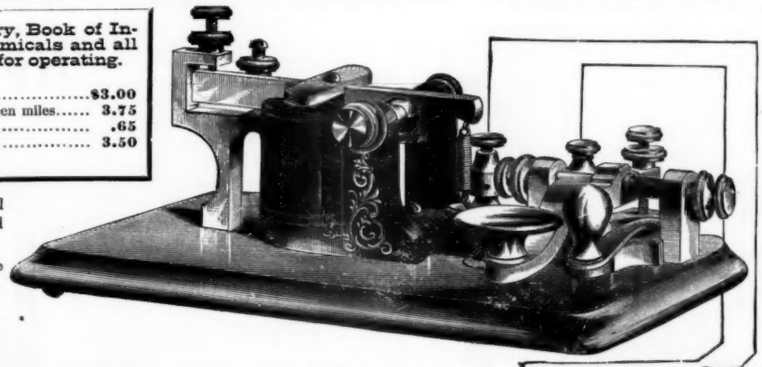

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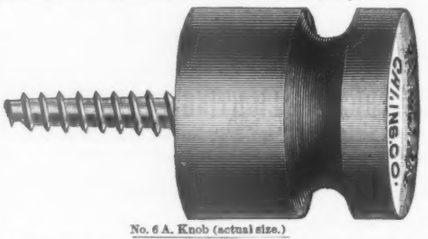

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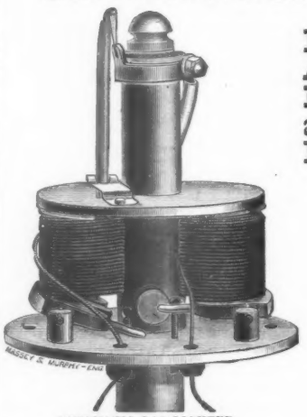
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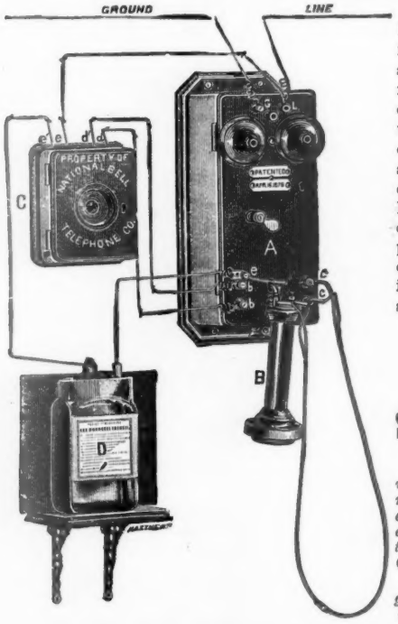

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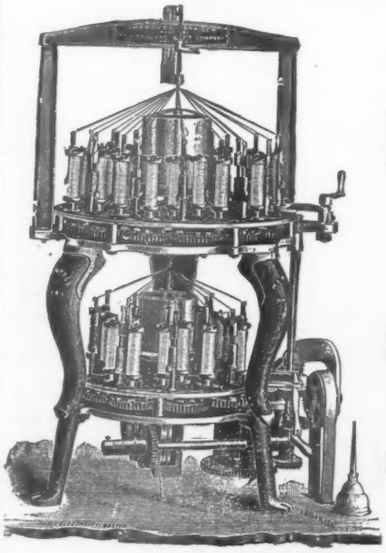

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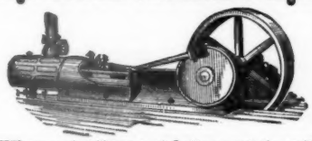

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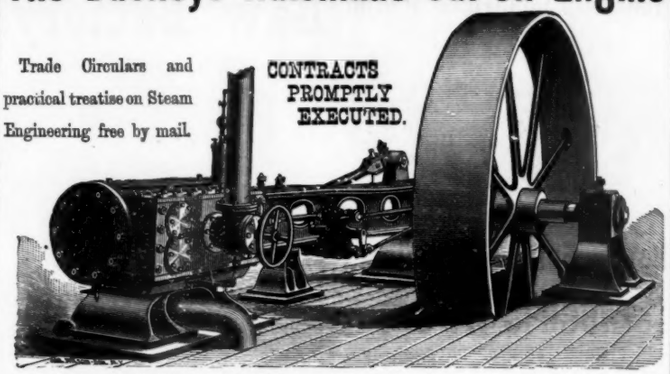

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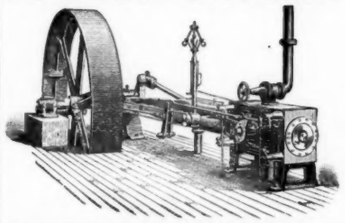

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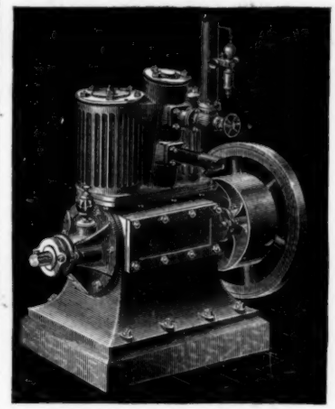

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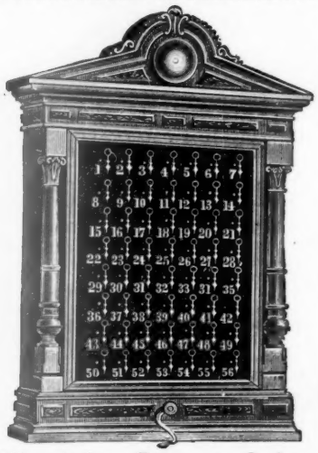

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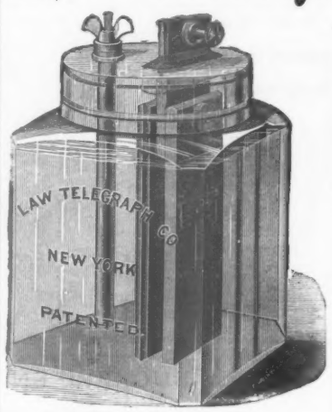

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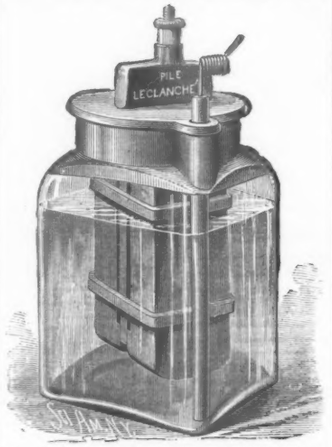

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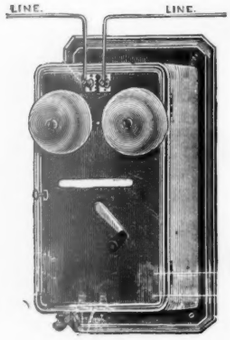

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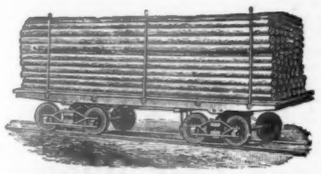

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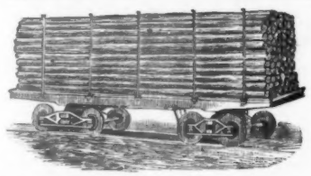

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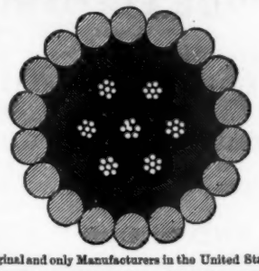

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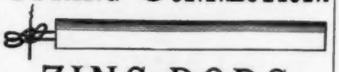

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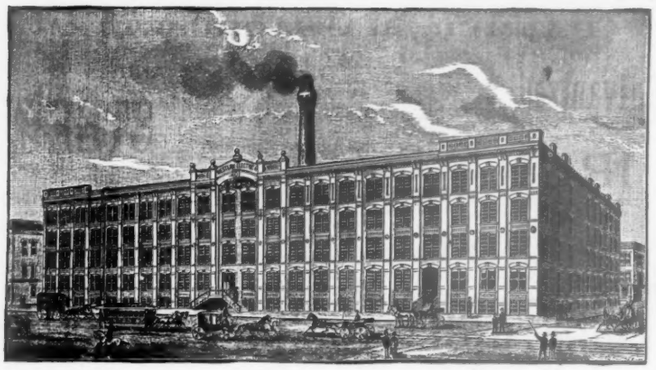

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